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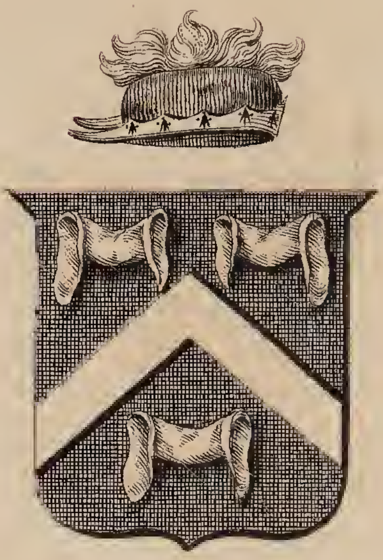

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A

COMPLEAT BODY
OF
HUSBANDRY.

CONTAINING
RULES for performing, in the moſt profitable
Manner, the whole Buſineſs of the Farmer and
Country Gentleman,
IN
Cultivating, *Planting* and *Stocking* of Land;

In judging of the ſeveral Kinds of *Seeds*, and of *Manures*; and
in the Management of *Arable* and *Paſture Grounds*:
TOGETHER WITH
The moſt approved Methods of Practice in the ſeveral
Branches of HUSBANDRY,
From ſowing the SEED, to getting in the CROP; and in Breeding
and Preſerving CATTLE, and Curing their DISEASES.
To which is annexed,
The whole Management of the ORCHARD, the
BREWHOUSE, and the DAIRY.
Compiled from the Original Papers of the late
THOMAS HALE, Eſq;
And enlarged by many new and uſeful Communications on
Practical Subjects,
From the Collections of Col. STEVENSON, Mr. RANDOLPH,
Mr. HAWKINS, Mr. STOREY, Mr. OSBORNE, the Reverend
Mr. TURNER, and others.

A WORK founded on Experience; and calculated for general Benefit;
conſiſting chiefly of Improvements made by modern Practitioners in
Farming; and containing many valuable and uſeful Diſcoveries, never
before publiſhed.

ILLUSTRATED WITH
A great Number of CUTS, containing Figures of the Inſtruments of
Huſbandry; of uſeful and poiſonous Plants, and various other Subjects,
engraved from Original Drawings.

Publiſhed by his Majeſty's Royal Licence and Authority.

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The INTRODUCTION.

Of ſtocking the Farm.

WE have informed the huſbandman concerning the nature of his ſoil, the advantages of incloſure, the uſe of manures, and the benefit of plantations; and we now advance to the ſtocking his farm.

When he knows the nature of his ground; and has fenced, planted and prepared it for his undertaking, it is ready to receive his cattle: part of which are to be fed upon its produce, and part employed in the labours of improving it. Theſe are a great expence, and they are expected to yield him a proportionable profit. They are in their nature qualified to do this; but the profit will be greater or leſs, in proportion to his ſkill in managing them.

From ſome he is to have labour, from others food, and from all he may have many occaſional, and, as it were, accidental profits. The horſe is to ſave him much toil of his ſervants, the ox and ſheep are to ſupply his kitchen and the market; as alſo, the hog: but the home conſumption is not all, many of the parts and products of his ſtock are exported at a great price; and he will be able to make the more advantage, as he is the better informed of every one of theſe particulars.

He is to conſider his cattle with reſpect to their food, and with regard to their dung: this will lead him to their proper management in the field, in his yard, and in the ſtable. The methods of regulating their food, litter, and ſtanding, will be a principal object of our attention.

We hope to lead him to a much more beneficial method in ſeveral reſpects than is generally known.

The reader is not to ſuppoſe us deficient with reſpect to thoſe articles, which, although they regard cattle, are reſerved to diſtinct and ſeparate parts of it.

In this place we conſider the huſbandman as purchaſing his ſtock, and diſpoſing and employing it on his land; after which we are to proceed to the immediate labours to be employed upon it. The ſeveral products of his ſtock in hides, tallow, and other articles are to be conſidered hereafter; alſo the diſeaſes to which the ſeveral kinds may be incident: for we do not ſuppoſe him to purchaſe one kind labouring under diſtempers; or to intend the immediate ſlaughtering of the others. In the preſent part of our undertaking, we are to conſider the creatures themſelves; their ſervice, breed, and management in every reſpect; and the methods whereby they may be rendered moſt beneficial to him while he keeps them, and moſt advantageous in the ſale, when it is proper he ſhould diſpoſe of them.

We ſhall divide theſe animals under four heads, two larger and more important. 1. His cattle and his poultry; and two leſſer, but yet worthy of his conſideration. 3. Fiſh; and, 4. Bees.

The two firſt demand the moſt careful attention, as on them depends a conſiderable part of the farmers expence, and his profits; the latter are not ſo much regarded as they deſerve, eſpecially the article of fiſh. We hope to be able to ſet this in ſo true a light, that the huſbandman ſhall underſtand it as one of the regular parts of his occupation, and not the leaſt in profit.

BOOK V. PART I.

Of CATTLE.

CHAP. I.

Of the horſe in general.

VOLUMES might be written on the horſe, and the ſubject not exhauſted: but the buſineſs here will be to ſelect from what has been ſaid, that which is to the immediate purpoſe of the huſbandman.

We ſhall endeavour to ſeparate the uſeful from the ſuperfluous; and no more to omit any part of the one, than load this treatiſe with the other. It is not our purpoſe to conſider the horſe as the racer, or in the manage, but as the uſeful ſervant of the huſbandman, who is to buy him for his purpoſes, with remembrance, that if he can breed from him, ſell him at an advantage, or any other way make him produce a certain profit, 'tis all within the compaſs of his profeſſion. We would no more have the farmer a jockey, than a ſportſman; but ſo much of every branch, as may be uſeful to himſelf, without tranſgreſſing the bounds of his profeſſion, we would have him know; and ſo much we ſhall endeavour to inform him.

The diſeaſes to which this animal is ſubject are numerous, and many of them little underſtood. Theſe deſtroy many a uſeful creature that might be preſerved with proper care; and after all that has been written on this matter; after the innumerable bundles of receipts in old authors, and the diſcoveries, great as they are, which have of later time been made by ingenious foreigners, as well as by our Gibſon, Bracken, Bartlet, and the reſt, there is no book in the Engliſh language ſo much wanted, as a compleat ſyſtem of farriery.

It is not within the compaſs of our undertaking to enter upon this at large, nor is any more than a part of what might be ſaid on it neceſſary to the farmer; but that part we ſhall endeavour to lay down, by the aſſiſtance of many enquiries, and a long experience, if not in a compleat, at leaſt in a uſeful manner.

It is but of late the conſideration of horſes has fallen into the hands of thoſe who had the requiſites for a due care of them. Farriers uſed to be of the moſt ignorant among mankind; and every blackſmith called himſelf a horſe doctor. Of late the great uſe of this creature in our various concerns of buſineſs and pleaſure, has reſcued it out of ſuch hands, and made it a ſubject for more education and abilities; and though the practice be yet far ſhort of perfection, many advances have been made in it, with which the huſbandman ſhould not be unacquainted.

So ignorant have the old writers been, that they are continually miſtaking the ſeat and place of the diſeaſes in this animal: nothing is ſo common, as to ſee thoſe who know no more of the creature than what they read in thoſe erroneous books, rowelling and burning a horſe in one place for a diſorder, the ſeat of which lies in another, which cannot be effected in any manner by what is done: excepting for the cheats of jockeyſhip, people are as unſkilful in every reſpect; for all that ſeems to be ſtudied now about a horſe is, how to deceive the purchaſer.

The diſeaſes of this creature, will be explained hereafter: here we ſhall endeavour to ſet the huſbandman right with reſpect to the nature and kind of his cattle, and his management of them in food, and at labour.

Horſes, though all of one ſpecies, may be divided into many kinds, according to the different ſervices for which they are deſigned. Thoſe for the nobler exerciſes, or the uſes of pleaſure, demand a great deal of care and trouble, as well as large expence; but the farmer's horſes, which are for labour only, require little of either.

Let him not take his directions from books, where the principal regard is ſhewn to the racer, the hunter, or the managed horſe: the plain and cheap practice uſed for the cart horſe, and the poorer ſort of road nags, is all that concerns him: this he will find here, and let him compare it with the management of his neighbours, to ſee how it agrees with that, and how it excels it: we would have him learn not only from what he reads, but what he ſees; and improve his knowledge from the miſcarriages as well as the ſucceſs of others.

CHAP. II.

Of the choice and management of horſes for the farm.

THE huſbandman muſt proportion the number and kind of horſes to his farm, and he is to conſider the ſex. In ſome caſes breeding from them may be a thing of great advantage, and under other circumſtances, it may not be prudent in him to think of it.

A certain proportion ſhould be kept up between the arable and paſture land of a farm; but this cannot be always done ſo exactly as might be wiſhed. The exceſs in either kind, where it cannot be avoided, will give the huſbandman a proper caution as to the ſex of this kind of cattle; as the nature of the employment for which he wants them alſo will.

The horſe for plow muſt be ſtrong, no matter for his ſhape: but for cart ſome care ſhould be had in the choice, and in the ſize. Theſe ſhould be big breaſted, large bodied, and ſtrong limbed; and they ſhould be bought of a moderate ſize, that they may match with one another; that others may eaſily be got to match with them when any die, or are ſold out.

The having horſes for ſlow draught all of a ſize, or nearly ſo, is a conſiderable article: for otherwiſe the team never work equally, nor at eaſe to themſelves. The huſbandman has not the advantage of half their ſtrength, though they go through an equal fatigue: the tall horſes hanging up the low, and it being altogether impoſſible they ſhould draw evenly together.

It is a benefit in the horſe intended for this ſervice to be ſluggiſh: the fitteſt for it are ſuch as require the whip, rather than ſuch as are ready to draw more than needful.

The farmer ſhould avoid that common fault, the making one horſe ſerve for different uſes. Let him never put a ſaddle upon his draught horſes, for it alters them in their pace, and renders them aukward and troubleſome in their proper labours.

In regard to the ſex, he is to be directed by the nature of his farm, and the proportion of one kind in his land to another.

Mares are more profitable than horſes, becauſe, beſide their labour and ſervice, they yearly will bring forth a colt. But let not the young farmer reſolve at once, for this reaſon upon the buying that ſex. If he have a great deal of paſture ground, in proportion to his arable, he will do right to ſtock himſelf with mares; but where the arable is the greateſt quantity, it will be more to his advantage to have horſes.

In ſome counties the farmers in general purchaſe mares, and in others they in general keep horſes: this is founded on what they find anſwer beſt, becauſe their lands are ſo diſpoſed. In ſome counties the arable is over-proportioned to the paſture ground; and theſe are the places where they keep horſes moſtly; in others the paſture ground overballances the arable, and theſe are the places where the run is upon mares.

When the nature of the farm recommends it to the huſbandman to purchaſe mares, it is of more importance to him to conſider their ſhape: becauſe on that will, in ſome meaſure, depend the value of the breed.

Let him chuſe mares with a good forehand, the neck, breaſt, and ſhoulders are to be his principal regard.

Let their body be large; for it is a great advantage to the foal to have room, while it is growing.

The foals the huſbandman ſhall have from mares thus choſen, will pay him for his care: they will generally be well-ſhaped; and it may be worth his while to ſell them at about ſix years old.

Let him not think that the keeping them to this age, is any hardſhip: their work, the greateſt part of the time, will pay for it.

Where the huſbandman has not the advantage of breeding, it is worth his while to buy colts young, and train them to that age for ſale. This is practiſed in many of thoſe counties where the arable in general exceeds the paſture.

The huſbandmen of Hertfordſhire buy foals out of Leiceſterſhire, which is a good breeding county, to ſell again to an advantage. They purchaſe them at two or three years old, and ſell them at ſix. The foals improve every year; their labour anſwers for their keeping, and at the end of this time they are fit for coach horſes, and are commonly ſold in London for that purpoſe.

In ſome counties horſes are much required for carriage of loads, packs, panniers and the like. When the huſbandman wants a horſe, for this purpoſe, let him chuſe him of a ſtout make, but not tall. Let him have a broad back, out ribs, full ſhoulders, and thick withers. This is a material circumſtance, for an horſe that is thin in that part is always galling.

Let him next obſerve his going: that horſe is beſt for this ſervice that takes the ſtouteſt and beſt ſtride: he is neither to trot nor gallop: all his buſineſs is a foot pace; and the horſe that takes the largeſt ſtep, goes eveneſt and rids ground faſteſt.

The horſes being thus purchaſed, the next thing is their management; and this is very eaſy. They are deſtined to coarſe ſervice, and they require nothing of thoſe pampered methods which are needful to the fine horſes, rendered delicate by idleneſs. They require no walkings, or nice dreſſings, but what they do want let the farmer ſee they have duly and regularly.

Let them be well dreſſed, and their bellies well filled: for otherwiſe they will never be able to go through their taſks. Beſide this let their ſhoes and their backs be conſtantly looked to, and little or nothing more is neceſſary.

Let their food be ſweet hay, or of other common kinds ſingle, or mixed, according to convenience: once in a week or ten days let him give them ſome warm grains and ſalt. This will keep them in health: for they will eſcape moſt of the common diſorders, by their conſtant exercife and labour.

If bleeding appear requiſite, ſpring or fall is the time, or both. If there be danger of any diſorder about his head, it is good now and then to burn a little frankincenſe under the horſes noſe, when he is about to lie down at night. In the heat of ſummer it is very good to take a labouring horſe into deep water, and ſwim him now and then.

It will do no horſe any harm to be bled every ſpring and fall; but if once this be made a cuſtom, let it be regularly obſerved: for as ſure as it is omitted he will have ſome diſorder. Nature expects theſe artificial diſcharges, if they have been brought into a cuſtom, as regularly as if they were her own, and can no more do without them.

A fat horſe ſhould drink often, and but a little at a time; but if he be lean let him drink as he pleaſes.

Rubbing does a great deal of good: and every horſe likes it. A horſe ſhould always be turned to graſs once a year;

for it cools his blood, ſcours off foul humours, and prepares his ſtomach to receive full nouriſhment from his other food.

CHAP. III.

Of the ſaddle horſe for the huſbandman.

WE have cautioned the farmer, not to put a ſaddle on his labouring horſes; therefore, as his occaſions will take him frequently on horſeback, he muſt keep one for that purpoſe.

The horſes bought for this uſe, may be ſerviceable on other occaſions: the draught, or load horſe, muſt not be taken from his work, becauſe it ſpoils his pace, but there are many little ſervices for which the ſaddle horſe will do, when he is not required for that uſe: and it will do him no ſort of harm to take him to them as neceſſity requires.

Let the huſbandman get one of as good a ſhape as his price will afford; for it is a general rule that the value of a horſe for the road may be judged by his form.

His head ſhould be lean, his eyes prominent, or full, and his neck well raiſed. Let his chine be well riſen, his joints ſtrong, and his paſterns ſhort and ſtrait, and ſo ſtrong as not to bend in his going: and let his hoofs be ſound, tough, and hollow.

Let him examine alſo his temper and diſpoſition. He ſhould be moderate: too dull a jade is as bad as a run-away. The huſbandman wants his nag for ſervice, and let him chuſe him ſuch as will do his buſineſs freely, without continual whipping; and yet not be eager to go on when there is no occaſion.

This care taken in the buying, the next concern is feeding him. His food ſhould be fine hay in winter, and ſweet graſs in ſummer; and to theſe are to be added dry oats, beans, peaſe, or bread, according to his occaſions.

Let him be watered two hours before he is taken out to ride, and rubbed, dreſſed, and fed; and after this let him be bridled up, and ſtand an hour before he is mounted.

At ſetting out on a journey, travel moderately in a morning, till the horſe be warmed, and then encreaſe the ſpeed as occaſion requires.

At night he ſhould be watered two miles before his journey's end; and then brought in warm: ſet up in a warm ſtable, and well rubbed and littered.

Let him have no meat while he is in a ſweat in any part, but when dry let him be rubbed and fed, according to his ſtomach and his duty.

If the road horſe wants appetite, change his food, for theſe creatures love variety as well as our-ſelves; and will often be tempted to eat new meat when they would not have touched the old. If this do not anſwer, let there be a ſmall quantity of white wine, ſalt, and vinegar mixed together, and let his tongue and noſtrils be rubbed with it. This ſeldoms fails to recover his appetite.

Let the rider look well to his back and to his feet. Let him ſee that the ſaddle does not gall, nor the girts pinch him; and that the ſhoes be large enough, and that they ſit faſt and eaſy.

The leſs he is uſed in long journeys, the leſs of this ſtrict care is neceſſary: but let it be proportioned to the duty. 'Tis always well to know the whole, and too much care never did a horſe harm.

CHAP. IV.

Of the breeding of horſes.

WHEN the farmer is ſituated in a good breeding country, there is nothing which he can practiſe to more advantage, both for his own ſervice and for ſale.

We ſhall lay down ſuch rules as may be neceſſary in this matter, and although the immediate purpoſe be breeding of horſes for the ſervice of the huſbandry, yet as the farmer may ſometimes ſtep a little beyond theſe bounds to his advantage, we ſhall not ſo exactly confine our inſtructions to them, as to diſcard totally the reſt.

The firſt conſideration, is that of the ground, for though he lives in a good breeding country, every part of it may not be ſuited alike to that uſe.

The ground proper for breeding of horſes is of a middle value, between the beſt and worſt. Horſes are a very valuable commodity, but let not their price tempt the huſbandman to enter raſhly upon this deſign. They are ſubject to many caſualties; and at beſt are a long while in riſing to their value: let him conſider whether he cannot make greater advantage of his ground in the common way of his employment, for it is very likely he may. If it appear that he can, then his land is too good; and he ſhould for that reaſon drop his deſign: on the contrary, he may be poſſeſſed of grounds, which as they will not produce much any other way, ſo they may not be rich enough for this. In that caſe he is alſo to drop it. In the one inſtance it is not worth his while; and in the other he cannot accompliſh it.

The condition of the grounds which ſhould tempt him to have mares for the ſake of breed, is where the paſture land bears an over-proportion to the arable: but a certain condition in this paſture ground is alſo requiſite. The proper paſture for breeding theſe creatures is of a middle nature.

It ſhould be ſuch as yields a ſhort graſs, but in good quantity: and it ſhould be high rather than low; and the ſoil muſt be ſuch as has ſome firmneſs, for its being hard under foot is an article of great advantage. We would not be underſtood that no other will do, but this is beſt.

There muſt be good water; and if it be full of mole hills, and other uneven places, it will be the better, becauſe it will uſe the colts to tread firm.

Good air is a great article alſo in a breeding ground: if it lye on an elevated ſituation, this will probably be the caſe: and further, it will be needful that there be good ſhelter.

Incloſed grounds are beſt for breeding, becauſe they are warm and defended; but open and common land may be uſed; only the huſbandman muſt be the more careful to provide convenient ſhelter; and muſt be more than ordinary careful of the mares juſt about the time of their foaling, and of the young while yet tender.

When he has a conſiderable quantity of land that he deſigns for this purpoſe, it ſhould be divided into ſeveral paſtures.

The pooreſt are for the ſtallion to run in with the mares: the moſt under ſhelter are to be kept for the mares to foal in: the fruitfulleſt and richeſt are to be reſerved for them while they are followed by their foals, and give milk: and laſtly, for the bringing up of the colts after they are wean'd, the largeſt, openeſt, and the moſt uneven ground is beſt.

According to the uſe for which the colts are deſigned, let the ſtallion and the mare be choſen. We have directed the choice of mares for huſbandry: for any other uſe they are to be ſelected with regard to that particular ſervice.

The ſtallion is alſo to be choſen according to the intended ſervice. The Turkiſh is an excellent kind for a horſe intended for the wars: the barb is the beſt for racers; the beſt for hunting is the baſtard barb begot of the Engliſh; the beſt for the coach is the Flemiſh; and the beſt for travel, draught or burthen, is the Engliſh.

Theſe are rules long ago laid down, and ſince that time often diſputed; but they are nevertheleſs maintained with reaſon by the moſt experienced to this day. Fancy and opinion ſo far prevail at this time, that it is ſcarce poſſible to find two people who will not diſpute upon this ſubject. However, he who obſerves theſe directions will not repent: for ſerviceable horſes for the huſbandman, the right Engliſh is the ſtallion, beyond all diſpute.

The beſt ſeaſon for putting the ſtallions and mares together is the middle of March, and the ſtallions ſhould be taken away again in the beginning of May. The time of foaling is of great conſequence: for the foal that falls in March is much more profitable than that which falls in May, having a part of the cold of that ſeaſon, and the whole enſuing winter to harden it. The colts foaled in March ſtand better, and are leſs liable to accidents than thoſe later in the year.

The farmer muſt have his paſtures in order for receiving his horſes and mares: but he muſt obſerve not to make his mares too fat before the time of their running with the ſtallions; for they conceive better, and hold better when they are in but ordinary caſe.

He ſhould give the mares three weeks reſt from labour after their conceiving: but after this they may be employed in the common affairs of huſbandry, not working them too hard. The farmer may, without any damage, keep them to work till the next ſpring; and then he ſhould let them run looſe till they foal.

This is the beſt method for mares that are breeders, but every part of it is not abſolutely neceſſary to be obſerved. If the farmer's affairs require, he may have more work out of them; but if he allow them ſo much reſt, they will do the better.

When the mare has foaled, ſhe ſhould be removed into the beſt paſture he has, for this will make her have plenty of milk, of a nouriſhing quality. The paſture muſt alſo have ſweet water and good ſhelter, eſpecially if the foal have fallen early: and the mare ſhould take care of it a good part of the ſummer, or the whole ſummer, and following winter. There is a notion the winter's milk is not wholſome, but that is a weak and idle fancy. The farmer is to ſuit all this practice to his other affairs, but of this he may be ſure, that if he can allow of it, the foal will be the ſtronger for running the whole year with his dam.

The foal will partake of the nature of both parents, but moſt of the mare.

Both the ſtallion and mare ſhould be ſound, if healthy colts are expected, for they will partake of the diſeaſes of their parents in both ſexes.

The way to have large colts, is, to chuſe large bodied mares, and to feed them well during the time of their pregnancy: very large foals have been thus produced from ſmall ſtallions.

A great deal of care ſhould be taken to keep the mares tame, and to make the colts alſo at firſt tame: the mares often injure them while in their bellies, by leaping hedges and ditches; and the foals damage themſelves while they are young by their unruly frolicks. A good way of keeping the mares gentle, is by giving them daily ſome work, for this accuſtoms them to be tended and handled; whereas when they run free the greateſt part of the time, they are difficult to be kept in order; to be removed from one paſture to another, or to have the foals properly tended.

Great nicety is uſed in breeding horſes for the finer employments; but 'tis the huſbandman I am directing, and he may in this manner avoid the trouble and expence of houſing his mares, and all that ceremony commonly practiſed. He will often have better foals thus than thoſe who obſerve the moſt exact rules; as we frequently ſee the children of ordinary people more healthy and ſtrong than thoſe of quality.

The age of a mare for breeding is from four to twelve years old, if ſhe have been employed in the common labour of huſbandry during the time; but if ſhe have been kept for breeding entirely, ſhe may be held to it a great many years longer.

The age of the horſe ſhould be from five years to fifteen.

When mares are kept altogether for breeding, it may be proper to beſtow more care upon them. It is a good method to feed them richly for a fortnight before their foaling, which will give them ſtrength, and plenty of milk: it will make them ready alſo the quicker to take horſe again.

Where a mare is thus managed, ſhe may be led to the ſtallion three weeks after foaling; and her foal may run by her till ſhe comes again.

CHAP. V.

Of weaning foals.

THE common practice is to wean a foal at about ſix months, when that falls out toward Michaelmas, or elſe about ſix weeks before the dam foals again, provided that happen in a good ſeaſon; but we rather adviſe the farmer to let his colt run by the dam till ſhe gets another: and in this we are ſupported by very profitable experience: the colt which has run the winter with his dam, is in general ſtouter and more healthy than ſuch a one as has been weaned at the approach of winter, whatever have been the care taken of him.

The weaning a foal at whatever age is an article of conſequence; and upon the proper conducting it depends in a great degree his future value. If care be not taken in weaning, and in the ſummering and wintering the colt for three years afterwards, he will never be worth nearly what he might under the right management.

The colt ſhould be taken from its dam over night, and driven into ſome warm and ſheltered place out of her hearing: it muſt be fed carefully in the morning; and from that time thoroughly attended for four or five days: it will then have forgot the dam; and may be turned out to take its chance: but care muſt be taken to keep it out of hearing of the mare for that whole ſummer, after which there will be no need of any particular caution.

Such as are intended for gelding, ſhould be cut at the time of their weaning, and then the ſame care ſerves: and as ſoon as thoſe few days are over, the part will be healed; and will occaſion no farther trouble.

After this the colts ſhould be ſeparated from the filleys, and each parcel turned out into ſome open paſture where they may have room, and a free good air; here they run at liberty till they are fit to be broke for hand.

Some geld their colts younger than we have directed, and when that can be done with convenience, it is as well. They do it while they ſuck, as ſoon as the teſticles come down: ſometimes gelding them at a fortnight old.

When it is done at this time, there ſeldom are any bad accidents attend it: all the damage that appears the other way is a little ſwelling of the parts; and this goes down when they have been kept carefully three or four days, which is what we have adviſed to be done on account of their weaning.

The two methods are ſo little different, that the huſbandman may follow which he likes beſt; but if he come to a reſolution in time, the doing it while the colt is very young, and is ſucking, is preferable.

For whatſoever ſervice the huſbandman intends his breed, and whether he raiſe fewer or more, it will be of great importance to obſerve theſe directions, relating to their breeding and weaning: we have made it as little troubleſome as poſſible; cutting off all that experience has ſhewn to be ſuperfluous in the common practice; but the little that is here ordered, he is to obſerve carefully.

CHAP. VI.

Of the breaking horſes for ſervice.

IN many things the greateſt advantages depend upon what appear to be ſmall matters, and it is thus in the caſe before us. We have given the huſbandman direction for breeding his colts; but he is yet to take the care of breaking them; and although this is ſufficiently regarded in horſes of the finer kind, no article of huſbandry is ſo ſhamefully neglected, as the proper care of firſt training the horſe to his ſeveral ſervices in that employment.

One common fault is, the neglecting to break them at a proper age. The ſparing a little trouble at a right time, is the ſpoiling many a good horſe.

The colt that is expected to turn out ſerviceable ſhould be broke early, and uſed gently at firſt. The common cuſtom ſpoils a ſaddle horſe, by making him do too much as ſoon as he is broke, and the uſual deſtruction of the draught horſe for meaner ſervice is the not breaking him in time.

A year after the colt has been turned looſe from his weaning, let him be taken up and gently and gradually tamed. Let him be uſed to the hand for another year; and when he is three years old, if he be for the ſaddle let him be backed; or if he be for draught or burthen let him be broke to it. Whichever be the caſe, let it be done gently and gradually. Let little be required for the firſt year; and more the ſecond, but in moderation.

The ſaddle colt ſhould be little more than walked the firſt year; and ſeldom carried beyond a trot the ſecond, after this there will be no danger of ſpoiling him, except by unreaſonable uſage. Let the colt be taken up at the ſame age for labour in huſbandry: but the firſt year let him draw but little; and the ſecond advance his labour moderately: thus he will by degrees be trained to know his ſtrength, and how he is to uſe it.

Gentle exerciſe an hour a day is enough the firſt year; and two or three hours a day the ſecond. The horſe does not come to his ſtrength till ſix or ſeven years old; and he never thoroughly comes to it at all, if he be too hard wrought while young.

There is no time nor ſervice really loſt this way; becauſe the horſe will ſtand ſerviceable many a year the longer for this care at firſt: he gets doubly at the end what he loſes in the beginning; and all the time of their ſervice the cattle are ſtouter, and do ſo much more.

How long a horſe will continue ſerviceable is a point not yet determined; nor indeed can fairly, except due care were taken of them at firſt; but as to their length of life, it is more than people imagine. Dr. Plot, chap. 7. page 37. of his hiſtory of Oxfordſhire, mentions no leſs than three horſes that he had ſeen in that county of about forty years old; and the late Duke of Montague had one which was confidently reported to be not much leſs than fifty. It had been kept without labour ſeveral years; but did not ſeem to have been a great many years paſt ſervice.

When the colt is firſt taken up he will often be ſullen and unruly: and it is a neglect at this age that makes the horſe vicious all his life. He muſt be brought to gentleneſs by hunger. Let him have no victuals but what he takes out of the hand.

If this do not anſwer let him be kept waking night after night: the moſt unruly horſe while young, will be rendered tractable in this manner.

Uſe the colt to gentleneſs while he follows the dam, by giving him good food from the hand: this will take off that natural ſhyneſs and fierceneſs which there is in every horſe, till made gentle by uſe.

A great time of a colt's growing unruly is, when he is firſt backed, or firſt brought to draw. In either caſe make him go in company of other horſes. When he is firſt rode let it be gently, with another horſe before him; and in the ſame manner, when the huſbandman firſt puts him to work, let him not be ſet to draw alone, but with others, and let his taſk be eaſy and ſhort.

The colt that would fly out, and do himſelf or thoſe that worked him a miſchief, if he were employed alone, or ſet to an heavy taſk at firſt; when the buſineſs is eaſy, and he ſees others of his own kind about him, ſoon ſubmits; and is eaſily led from the lighter to the harder, and finally to the hardeſt duties.

CHAP. VII.

Of the number and working of horſes.

AS the huſbandman is to ſuit the ſex of his draught cattle, to the nature of his ground: he ſhould alſo conſider their kind and ſize: that ſort of horſes may ſuit with one farm, which will not do well upon another.

Richneſs of the paſturage, and the ſize of the cattle, are to be proportioned to one another. He who has rich ground ſhould breed large horſes, for they will every way be moſt advantageous; and he whoſe land is poor muſt content himſelf with a ſmaller ſort.

Horſes muſt be well fed, if they go through a great deal of work; and large horſes will never be fed ſufficiently upon poor paſtures. It is not eaſy to ſay what number of horſes will anſwer the huſbandman's purpoſe, for any quantity of ground. This has been attempted, but the differences between one kind of land and another, in the degree of labour they require, makes it impoſſible to determine with certainty. In land of a middle ſort, one horſe to ten acres will anſwer the careful and ſkilful huſbandman's purpoſe: but he that wants knowledge and management, may uſe twice as many without doing half the buſineſs.

When the number of horſes has been ſettled, the next care is the proportioning the work among them.

The young ones are to be worked gently: they may be continually kept doing ſomething at the harveſt, ſeed time and fallowing. There are ſufficient articles of drudgery in the farmer's buſineſs, and theſe he is to throw upon ſuch horſes as will never be worth any thing by ſale. He is to keep a proper number of theſe for hard work; and though they be aged or blind they will anſwer his ends, provided they are well fed. The ſlight work of the others, accuſtoms them to their geers, and makes them bring the better profit upon ſale.

The huſbandman who buys young colts, in order to ſell them again, muſt take care in the choice: for ſuch as they are, ſuch they will grow up: and he who breeds muſt be careful of his ſtallions and mares, otherwiſe he may be greatly diſappointed, when he comes to the ſale. With due caution there is hardly a more profitable article, for there are always purchaſers for them, and the price, if they be well choſen, is conſiderable: but I have often known the huſbandman, when he has taken a good number of them to the fair, forced to ſell them for little, or to keep them on his hands.

Blindneſs and other accidents will happen to horſes ever ſo carefully bought, or bred; but all dealings admit of ſome accidents: we do not pretend that of horſes is more exempt from them than the reſt; on the contrary, it is perhaps as precarious as any; but the more uncertain of ſucceſs it is, the more ought the cauſes of that uncertainty to be watched; and the more needful is a ſtrict obſervance of thoſe rules which may prevent the loſſes that often attend upon it.

As the horſe is the firſt and moſt conſiderable of all the animals that are of ſervice to mankind, the ſtrongeſt, ſwifteſt, and moſt generally uſeful; it is a creature that will naturally be of certain and ready ſale: the variety of uſes in which he is employed, will make a demand for all kinds, and thoſe of all qualities. 'Tis therefore an article of ſo much profit, and ſo naturally and commodiouſly in the way of the huſbandman, that he ſhould never be deterr'd from it, by poſſible loſſes. His profits will be certain, including all things, and the degree of them will be proportioned to his ſkill and care.

By ſkill we do not mean that of a jockey, which is rather artifice and cunning. It is unworthy of an honeſt man; and it would take off the farmer from his more uſeful ſtudies,

ſtudies. We mean by ſkill nothing more than a knowledge of thoſe plain and general facts, laid down here in few words; and by care his keeping that knowledge in mind; and acting according to it on all occaſions.

CHAP. VIII.

Of the turning horſes to graſs, and taking them up to the ſtable.

THE proper time for the giving the huſbandman's horſe green food, is in the beginning of May, and the time for taking him up is toward the end of Auguſt.

In Buckinghamſhire, and the neighbouring counties, the cuſtom is to turn out the draught horſes in the middle of May, into their encloſed fields of clover. This is a rank food, but it gives great ſtrength and heart. The beaſt does his buſineſs in the laborious articles of huſbandry, more conſtantly and freely upon this graſs than any other; and experience ſhews that he is leſs liable to colds, and many other accidents, than when fed on the finer kinds.

Let the horſes be turned out firſt in the heat of the day: and if it be a wet or cold ſeaſon, take them in at night, till it is more favourable.

Work them as uſual, while they are at graſs, taking them up in the morning, and giving them a moderate feed of corn and chaff, two hours before they are collar'd; and repeat the ſame after they come from work. This keeps them in great heart; and ſomewhat dries the green and moiſt food in their bodies.

In Hertfordſhire it is a practice to turn the cart and plow horſes into a field of green vetches, fettering them if there be occaſion; this is a very ſtrengthening and wholeſome food.

In other places, freſh food is given the horſes in racks. They mow the clover, vetches, or the like, in ſmall quantities, as they want it. Lucerne and ſaint foine may be cut in the ſame manner with great advantage.

Another good method is to ſow ſome ground purpoſely for this uſe with the three ſeeds of clover, ray graſs, and common trefoil; and cut it freſh for their eating in the racks. This keeps them freſh and in good heart, under the tighteſt duty. In theſe ſeveral methods alſo, by the help of ſtraw, there is a great deal of good dung made for the ſervice of the fields.

This freſh cutting of clover, vetches, and the like, may be practiſed in vale ridge half acre lands, as well as in chilturn incloſed fields; and is attended with great advantage.

Let not any ſuppoſe us deficient, becauſe we do not lay down the methods preſcribed in books, and practiſed by jockeys, of bleeding the horſes, and all their other practices upon the change of food. It is idleneſs more than the alteration of the diet, that cauſes the diſorders into which horſes that are bred for finer ſervices fall, at theſe ſeaſons. The huſbandman keeps his cattle to their labour; and if he does this rightly, it will anſwer all the purpoſe of bleeding and drenches.

In common field lands the horſe is ſtaked down with ropes, where he is put to eat the graſs: where this cannot be avoided, the farmer muſt be content; but it is a ſorry method. The creature is neceſſitated to drop his dung and urine on the graſs; and he will not eat it immediately after. The remedy is frequent removing of him, for he will eat the ſpot on which he dung'd after a little time, though he will not while the taſte is ſtrong in it.

A horſe may be ſtaked not only on a piece of graſs in a common field, but alſo on a piece of green vetches, and will thrive upon it very well: but there is the danger of his breaking looſe in theſe places, and in that caſe he generally does a great deal of miſchief.

In the ſandy parts of Norfolk, they ſow turneps for the ſummer food of their horſes, and other cattle. They give it them in the manger, ſometimes in the field; and it anſwers very well either way.

They ſow a particular kind of turnep for this uſe, known by the name of the yellow turnep. The ſeed is ſold at every ſeed ſhop. They ſow it in March, and the turneps are ready to pull at the end of May; and they continue ſowing again and again once in ſix weeks, for a conſtant ſupply, till the latter end of September; in all which time it keeps the cattle in excellent heart, and enables them to go through their work equally to any food whatever.

In theſe counties, they have a cuſtom of ſpaying their filly foals. They do this at a month or ſix weeks old, while they ſuck, and it is attended with no danger. The mare becomes a particular, and a very uſeful creature; grows large and very ſtrong, and in general is preferable to a gelding.

The only inconvenience theſe mares are liable to is overgrowing at the joints, which ſometimes makes a weakneſs in thoſe parts; but this may be, in ſome degree prevented, by ſpaying them when they are a little farther advanced in their growth. A very good time is juſt when they are taken from the dam, when that is done at ſix months, for the cutting heals while they are under the care of the weaner.

At the approach of winter it is the cuſtom to take up the horſes, becauſe the graſs becomes ſhort, and the ſeaſon cold: but the condition of the creature ought to be the rule for this, more than the month of the year. So long as he can well endure the weather, and the food anſwers for him, he will be much better in the field, than in the ſtable: and the ſaving the expence of ſtable food is no trifling article.

It is a good method to moderate between the two, by taking them into a ſtable at nights, and turning them out by day; as the ſeaſon may require.

Another way of moderating the matter may anſwer very well, in the following manner. Let a number of hovels be built in the yard: their ſhape to be a long ſquare, the front and ends open, and the farther ſide boarded up; and the top covered with furze, or other cheap ſtuff. Againſt the boarded part are to be fixed the mangers; and the horſes are to have acceſs to theſe when they like. Thus they run looſe, or are under cover as they chuſe; and when oats are given them they feed dry: this does not make them tender like keeping them in the ſtable; and is excellent for preſerving their feet, and keeping them in health and heart.

The horſes in this management, are not to have liberty to run farther than about the yard, becauſe their dung would be loſt: whereas, in this way, all is ſaved, and the horſes eſcape the confinement of the ſtable.

As to the feeding the huſbandman's horſes, the beſt way is this.

In winter let thoſe who have the care of them be up at five o'clock; and in ſummer at four; and let them bait their horſes. Mix ſplit beans, bran, oats and chaff, or elſe mix oats, bran, and chaff only; and give them a little at a time, dreſſing them while they are eating. Bran is a very neceſſary ingredient, becauſe it makes the chaff go down, and ſome give it all the year, accounting that it ſaves corn, and does the horſe ſufficient ſervice.

Half a peck of oats may be given in the morning before going to plow, and the ſame in the afternoon: or after they have baited a little while in the afternoon, a little hay may be given them, and they may be led to water. This is a good method where a horſe ſeems to want a right appetite, for they never fail to eat after it freely.

Chaff mixed with the oats is uſeful upon theſe occaſions, and a little being given at a time, the creature eats it the more heartily and freely, and it digeſts the more perfectly.

Whatever method be taken, let the huſbandman be ſure his horſe has food enough: for, whatever he withholds in this reſpect, is to his own damage. He ſuffers more by it than the horſe; for the creature cannot perform his work well, nor will he be fit for ſale unleſs to a great diſadvantage. Many a horſe has been reduced half his value, by the ſaving a ſmall proportion of that charge in his food: this is frequently in other inſtances alſo the effect of fooliſh frugality. I ſhall recommend the huſbandman in all things to œconomy, but let it be under the guidance of prudence. I have adviſed him to ſpare no expence in manuring his lands, becauſe the crop will be ſure to repay it; and in the ſame manner he may be ſure that good feeding of his cattle will be paid him doubly, partly in their going thro' their work, and partly in their improvement for ſale.

CHAP. IX.

Of the aſs.

THE aſs follows the horſe in this place, not as the next in value, for he bears no proportion to the horned cattle; but becauſe he approaches in ſome things to the nature of the horſe, and is employed in the ſame kind of ſervices.

The aſs in London is the moſt to be pitied of all creatures; and in many parts of the couutry he does not fare much better. He endures great fatigue, and his patience is as a virtue. This is a creature that may be made more uſeful than it generally is; and that deſerves much better treatment than it commonly meets with.

A French author has written a treatiſe, to prove that the aſs is the moſt uſeful to man of all animals; he founds this aſſertion upon its doing a great deal of buſineſs, and being kept at a very ſmall expence. But although we ſhall not altogether agree with this writer, yet we may with reaſon endeavour to ſet the creature upon a more reſpectable footing with mankind, than that wherein he uſually ſtands.

The aſs may be purchaſed at a ſmall price, as well as kept at a ſmall expence, and is therefore a uſeful creature to ſuch as want the labour of ſuch an animal, and have neither money to purchaſe a horſe, nor food to ſupport him.

The aſs will do a great deal of work, and will bear all ſort of inconveniencies. He endures fatigue, heat, cold, hunger and thirſt better than any creature. He is liable to very few diſorders; is very long liv'd; and retains his ſtrength and abilities for doing ſervice to a great age. All this ſhould recommend this creature to the poorer ſort of huſbandmen in the ſtrongeſt manner.

He will live upon a common be it ever ſo barren, a whiſp of ſtraw is very acceptable food: he will crop briars and thiſtles; and chaff is a treat to him. A little more care might be afforded him than is generally allowed; and he would repay it with very large increaſe of labour.

No creature is better ſuited to carry burthens: it will alſo raiſe water in deep wells, and work in mills full as well as a horſe, and will not ſtand the owner in near the expence of the very worſt of that kind.

Aſſes draw burthens of ſand in a ſorry kind of carts, ill-harneſſed, ill-tended, and under every poſſible diſadvantage. No doubt the huſbandman, who would give them tolerable tendance, would find his account in it in many kinds of carriage.

The aſs may be made to anſwer the purpoſe of the horſe in plowing, eſpecially in light lands: and every ſaving to the farmer being ſo much gain, here would be a very conſiderable profit: for the worſt horſes muſt be fed at a conſiderable expence, to enable them to go through their labour.

The ſhe aſs has a particular value on account of her milk, which is preſcribed by phyſicians for many diſorders; and in London brings a large price.

The inconveniencies are principally three: their ſlowneſs, their ſtubbornneſs, and the damage they are apt to do among trees.

Their ſlowneſs is a fault they can never be expected to mend, for it is in their nature: we are to take creatures with their natural imperfections, and this is that of the aſs: but thoſe faults are generally attended with advantages, as this in particular very plainly is. The ſlowneſs of this creature being the very thing that enables him to continue ſo long at his labour; and undergo ſuch laſting fatigue: if his motions were quicker, he would tire like the horſe, and other animals.

As to his ſtubbornneſs and obſtinacy, no creature is ſo ridiculouſly reſtiff when he is provoked beyond his patience; or ſometimes without provocation. Something of this may be in nature, as well as his ſlowneſs; but a great deal is owing to his ill management. No creature is ſo little regarded, or treated with ſuch wanton cruelty. He is generally put into the hands of boys, or the worſt of ſervants, who increaſe his natural obſtinacy by their uſage.

Let the aſs be taken moderate care of; and treated a little like a horſe, though it were but like the very meaneſt kinds; and if he does not become altogether ſo tractable as that creature, he will loſe enough of his natural faults to be rendered very uſeful; and will fully anſwer the care that has been taken of him.

It is likely the aſs ſhould crop, and ſometimes bark trees, for they are his natural food: but it is not particular to this animal. We have given frequent directions for defending young plantations of all kinds from the croping of animals. The ſame care that preſerves them from others, will keep them alſo from being damaged by this creature; and where that cannot be done, he muſt be kept from them.

If any one ſhould take a reſolution of keeping many aſſes, he might, with a little care, prevent this miſchief.

Among other benefits attending the keeping this creature, is to be reckoned the breeding of mules, a thing practiſed to vaſt advantage in many parts of Europe, and which we have not yet introduced to general practice in England.

As we have recommended the keeping of aſſes, we ſhall not leave the ſubject without giving him directions for their choice.

Aſſes brought from ſome warmer parts of Europe, are preferable to ours in ſtature, and for the breeding both of their own kind and mules: when we ſee one of theſe compared with one of the wretched creatures of our own country, we muſt allow the advantage of giving the aſs proper care, for they are better looked after in thoſe places; and their excellence is in a great meaſure owing to that.

Where one of theſe aſſes can be had, it is to be preferred; but this is a particular caſe. I ſhall ſuppoſe the huſbandman is to chuſe out of ſuch as our own country lays before him: among theſe let him ſelect ſuch as are bulky, and well ſquared; ſuch as have large and full eyes, wide noſtrils, and long necks. The breaſt of an aſs ſhould be broad; his ſhoulders ſhould ſtand high; and he ſhould have a full back. The ſhortneſs of the tail is a mark of ſtrength and hardineſs.

The beſt colour is dark; the nearer black, the ſtouter they are found on trial; and the hair lying ſleek, is a good ſign of their being in health and vigour.

Let the huſbandman chuſe a few in this manner, and from theſe raiſe a breed.

The beſt time for covering is in April or May: the end of March or beginning of June will do; but earlier or later than the firſt or the laſt of theſe it ſhould not be.

The beſt age of the aſs for breeding is five, ſix or ſeven years: ſhe may be uſed for this purpoſe from three years old to ten; but ſhe is in her greateſt vigour, and will bring forth the fineſt colts at about ſeven.

A ſtout he aſs, and a large bodied ſhe, ſhould be choſen for breeding; and ſhe ſhould be wrought gently toward the end of the time ſhe is going.

Theſe are eaſy directions; but they will be found of great uſe: and if the farmer add to this care of breeding them, a very little tending when grown up, he will be able to ſhew aſſes, if not equal to thoſe of ſome other parts of Europe, at leaſt greatly ſuperior to thoſe commonly ſeen in England; and he will by their means do a great part of his common buſineſs as well as with horſes, and at a much ſmaller expence.

CHAP. X.

Of the mule.

AFTER the mention of the horſe and the aſs, follows the mule, produced between the two, and of a middle ſtature between them.

The mule has the good qualities of the aſs without its bad ones. It is as patient of fatigue, and as capable of enduring hunger, but it is as tractable as the horſe; and is ſufficiently ſwift of foot for any common ſervice. When properly bred it is alſo a handſome creature: and it is indeed ſo well fitted for ſo many ſervices, that nothing can be more worth while than raiſing them.

The mule is often of the ſize of an ordinary horſe, ſome are ſixteen or ſeventeen hands high. They are ſtrong and ſure footed. This is the quality for which they are valued in many parts of Europe, where the roads are mountainous and ſtony; they will go with the greateſt ſafety, where a horſe would break his neck.

They perform well alſo in draught; and will travel many weeks together with ſix or ſeven hundred weight on their backs, without any ſign of uncommon fatigue.

The mule is bred from the copulation of an aſs and a mare. Thoſe for travel and ſhew are bred from large he aſſes and Spaniſh mares: theſe are tall and ſtately, their colour uſually inclining to black, and they are very handſome. A larger and ſtouter kind are bred from the ſame aſſes, and large Flanders mares: theſe are frequently ſeventeen hands high, and as large ſet as our common coach horſes. They are ſtronger than horſes of the ſame ſize, and will bear greater hardſhips, and be fed at much leſs expence. At the ſame time they are much leſs ſubject to diſtempers.

They are fit for the ſaddle, as well as for theſe laborious employments: they are very manageable, and walk and trot very eaſy. They may be ſuited to the ſervices for which they are deſigned, by the choice of proper mares, for they take after them. Thoſe for the road ſhould be bred from light made mares; and thoſe for cart, plow, and the like, from the larger bodied and ſtouter kinds.

There is a ſubſtantial reaſon why we ſhould breed them in England, which is, that ſuch as are bred in colder countries, are always better and longer lived than thoſe in hot. As to their being vicious, it is a complaint only made where there are but few of them, and thoſe ill taken care of; for where they are common, and are treated in the ſame manner as horſes, they are as inoffenſive.

Beſide the mule already mentioned, which is bred between the aſs and the mare, and is a light, beautiful, and lively creature; there is another kind propagated in ſome places, between the horſe and the ſhe aſs; but this is an inferior kind.

Foals take more after the nature of the female than the male parent; and the ſame thing is ſeen very plainly in the breed of mules: thoſe between the aſs and the mare partaking of the nature of the mare, being beautiful, lively and ſwift; and only inheriting the good qualities of the aſs, his patience, ſtrength, and perſeverance under fatigue: while thoſe bred from a horſe and a ſhe aſs, are of the aſs kind, dull, heavy, ſluggiſh, ill-made and ſmall. There is very little temptation to breed theſe any where, becauſe the others may be had with as little trouble. Let the huſbandman therefore who ſhall breed mules, take care he does not fall into the miſtake of ſuppoſing 'tis the ſame thing, ſo one parent be of the aſs kind, which of the two it is.

As the mare is to be ſuited to the ſervice for which the mule is intended, care muſt be taken to have a proper aſs. And above all things he muſt be large. The fine mules are bred from the tall aſſes; purchaſed at a vaſt price, and from the fineſt mares. The mare is put into a hollow place railed in, and the aſs has the advantage of higher ground in covering.

We ſee in the mule, the abhorrence of nature to monſters, or animals of mixed breeds. It was once believed, that new creatures were every year produced in Africa, from the copulation of different kinds, and that the increaſe of thoſe monſters continued: but this is an error; and we ſee in the mule, two creatures of a different, though like kind, are difficultly brought to copulate; and when they are, although they produce a creature different from either, as the mule; that creature is not able to propagate its kind again.

The mare is averſe to receive the aſs, and the ſhe aſs is unwilling to admit the horſe to copulation: where they breed mules frequently, it is a practice to make the aſs colt ſuck a mare: and the mare foal ſuck an aſs, to make them familiar. This has no real effect, but it ſhews how ſenſible the breeders of mules are, that thoſe creatures do not go freely and willingly together.

CHAP. XI.

Of the bull, and his kind.

UNDER this head are included, the bull, cow, ox, and calf, each a conſiderable article in the huſbandman's profeſſion. The cow is the principal, though the female, becauſe ſhe is the moſt univerſally uſeful; but before we enter upon her nature and qualities, we ſhall treat of the bull in his natural condition, and of the ox; as a knowledge of theſe will beſt lead to the other.

There are bulls of ſeveral kinds, under the name of buffaloes, and the like diſtinctions: but in England we have only one kind.

Ours differ only in their ſize, according to the counties in which they are bred. The various parts of this kingdom afford ſo different paſturage for cattle; that when they are brought into other places, they are called after the name of that whence they came. The Lancaſhire breed is large, the Welch are ſmaller, and the Scotch leaſt of all. In Staffordſhire they are commonly black, and in Glouceſterſhire red; and they have the like differences in other counties.

The huſbandman ſhould be accquainted with the ſeveral breeds, that he may ſuit his purchaſe to his land.

The larger kinds are bred where there is good nouriſhment, and they require the ſame where they are kept, or they will decline: the poorer and ſmaller kinds which are uſed to hard fare, will thrive and fatten upon a moderate land.

The huſbandman is to remember here what we have ſaid of trees: they never thrive if tranſplanted out of a rich into a poor ſoil: the ſame holds good in cattle.

The huſbandman ſhould have one of theſe conſiderations in view, in ſtocking his land, the uſing them principally for breed, for milk, or for work: and according as either of theſe is his principal aim, he is to make his purchaſe,

purchaſe: one breed being fitter for one of theſe uſes, another for another.

He muſt alſo conſider the richneſs of his paſtures, that he may ſuit the breed to that alſo. If his ground be perfectly rich, he ſhould buy the largeſt cattle, the Derbyſhire, Staffordſhire or Lancaſhire kind; if poorer he ſhould purchaſe the Angleſea or Welch, for they will thrive and fatten upon moderate ground.

Whatever breed he chuſes, he ſhould keep entirely to it; that is, the bull and cows ſhould be all of the ſame kind; for it is a general and true obſervation, that a mixed race does not ſucceed ſo well.

We ſhall now proceed to ſpeak of the bull in general: for the marks of a good one, are the ſame in all the breeds.

Let his forehead be broad, and the hair upon it well frizzled and turned in ſmall curls. Let his countenance be ſharp, his eyes large and full, the blacker the better. Let his horns be moderately long. His neck thick and fleſhy; and his body long and large. His breaſt ſhould be big, his back ſtrait and flat, his buttocks large and ſquare, and his thighs round. His legs ſhould be ſtrait, his joints ſhort, and the hair ſhould lie ſmooth and even upon his body. This ſort of bull anſwers beſt for breed. The oxen from him are inclined to be large and ſtrong; and are fit for draught as well as feeding.

Thoſe who are yet more curious in their breed, obſerve that the ears of the bull be rough within, that his noſtrils be wide, and his dewlap thin, long and hairy; that his tail ſtand high, that his knees be large and round, and his hoofs long and hollow. All this nicety is not neceſſary to be obſerved; but if he anſwer the deſcription in all points it is ſo much the better. The others before delivered are of great conſequence, and the huſbandman ſhould obſerve them ſtrictly.

The breed will partake more of the nature of the female than the male; yet ſo much depends upon the male, eſpecially in the form of the ox, and moſt particularly when they breed that creature to labour; that the owner can never be too particular in his examination.

The uſe of the bull is underſtood to be only in propagation: in moſt places he is ſuffered to run looſe, living a quiet life, with no care but his pleaſures. This, however, is not neceſſary. The bull is an animal of ſtrength as well as the ox, and there is no reaſon why he ſhould not be employed in the ſame manner. This is not generally practiſed, but by an account we have received from a correſpondent, who writes nothing but what he has tried, it is plain the practice may be introduced any where with advantage.

To ****

" Whereas you have deſired me to let you know any " thing that ſhould fall in my way in the courſe of huſban- " dry not commonly practiſed, I take this opportunity " of acquainting you with a uſe I have found for my " bulls.

" You know it has always been my practice to raiſe " more of this kind than others do with ſuch a ſtock as " mine; but I fancy they generally don't allow bulls e- " nough to their cows; and that the breed ſuffers by it. " Howſoever that be, I keep a larger number, and feeding " them ſeperate, I ſeldom have any miſchief among " them. But it came into my thoughts that I might as " well have ſome good of them beſide juſt the breed, and " not keep ſo many large creatures only for that ſervice. " Upon this I began to think of ſetting one of my ſtouteſt " bulls to labour.

" This is not a country, where they put oxen to " draught: ſo whether or no they uſe the bulls in thoſe " places for the ſame work, I can't tell: but by what I " hear, I believe not.

" I tryed one of my ſtrongeſt bulls firſt at cart. We " had ſome large timber to carry, and I made them put the " bull to the carriage. He was ſtubborn at firſt, but after " four or five trials he would draw very well. I find him " ſlow but very ſtrong.

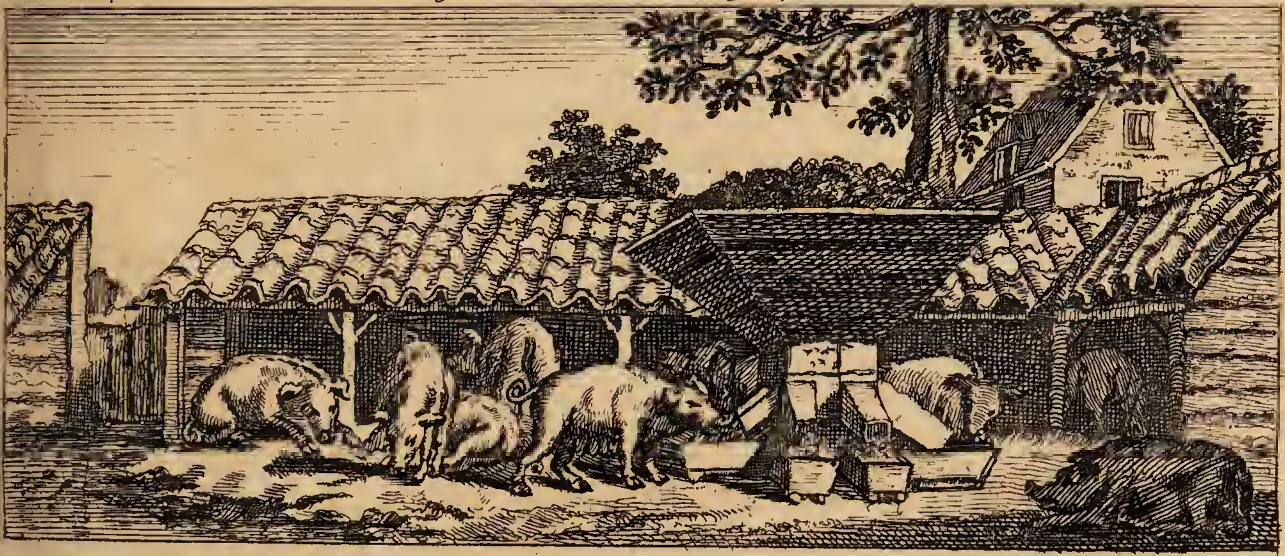
" I uſe him not only in the carriage of timber; but in " drawing the clay from the Norfield pit, to the ſandy piece " you adviſed me to dreſs with it, and he will pull a vaſt " load.

" I have tryed to put a couple of them to a cart toge- " ther, but they do no better than one, for they will never " draw equally. One pulls all, and the other lags, or " walks eaſy. I have alſo tryed to yoke them for plowing, " but it does not do. But the firſt bull that I broke to " drawing, works very willingly at plow alone, and I have " turned up my heavieſt ſoils with him.

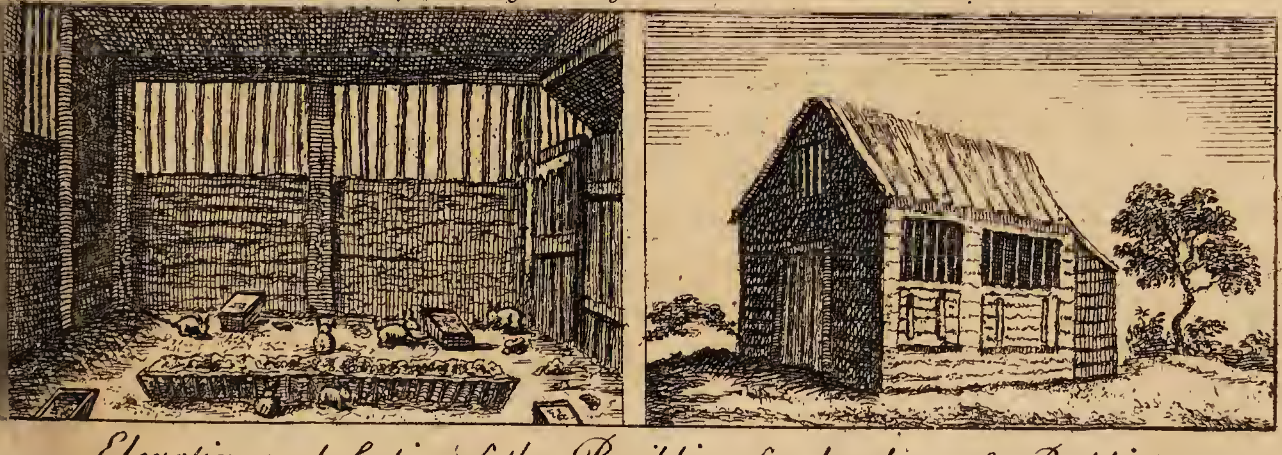
I

The Pit for breeding Mules. *The Bull put to Labour.*

The Washing and Shearing of Sheep.



The Method of feeding Hogs without Waste.



Elevation and Section of the Building for breeding of Rabbits

Compleat Body of Husbandry.

“ I write freely what can be done, and what cannot, ſo
“ far as my ſmall practice informs me; I have computed all
“ things, and am convinced it would be much to the
“ advantage of huſbandry, if bulls were made to work
“ every where. I have been able yet only to make them
“ draw ſingly, but perhaps, others upon more trial, may
“ bring them to go together.

I am,
your humble ſervant,
R. G.

It is needleſs to add any remarks on this plain letter. It is in every ones power to try whether bulls labour anſwers according to this account; and, if ſo, it will be worth while to ſee how far they may be brought to work together: not that in this caſe they are of equal value with the ox, who, beſide his labour, has his fleſh for market: but there is no reaſon any part of the huſbandman's ſtock ſhould lie idle. The bull feeds and he ought to work. Being properly employed he will not be at all the leſs fit for his buſineſs in propagating the ſpecies: rather the fitter.

The diverſion of running and baiting the bull at certain times of the year is very old, and has been practiſed in many parts of the world, and in moſt at the ſame ſeaſon. We had it from the Spaniards, whoſe bull fights are famous; and they from the Romans, and the Romans from the Greeks. Julius Cæſar brought it to Rome, and he profeſſedly learned it of the Theſſalians. In Greece, Rome, Spain and England, the ſeaſon for it has always been in the month of Auguſt.

The bull is often miſchievous; but it is in a great meaſure owing to his being kept idle. Many a life is loſt in England by this creature; but if it ſhould become a cuſtom to train them to labour, there would be an end of that miſchief. The bull is the only creature of ſuch ſize and power that is left to himſelf. If he were worked, partly the labour, and partly being accuſtomed to mankind, would tame him, and make him as harmleſs as horſes and other animals. They are often naturally vicious as well as the bull; but it is their being continually in the way of management that breaks them.

CHAP.

CHAP. XII.

Of the ox.

IF the farmers land be rich, let him ſtock it with the largeſt oxen that can be raiſed, for they are much the moſt profitable.

The Yorkſhire oxen are in general black all over, and are a very large, firm and valuable kind. None exceed them for labour, and few will feed like them. The oxen of Staffordſhire, are alſo of this kind. Thoſe of Lincolnſhire are in general red and white: they are very bulky, and equal to any in value. The oxen of Somerſetſhire, and ſome of the adjoining counties, are naturally red. Theſe are alſo a very fine, large, and valuable breed.

If he intend to breed his oxen to draught and labour, the black Yorkſhire breed is the beſt: if for market only, Lincolnſhire are preferable: the red Somerſetſhire ox is for either uſe, and is an excellent kind.

The Lincolnſhire breed requires the richeſt paſture: but none of them will come to their perfection, unleſs they have very good feeding.

The reader is not to ſuppoſe, all the oxen of Yorkſhire are black, all thoſe of Glouceſterſhire and Somerſetſhire red, or all the Lincolnſhire oxen pyed.

Theſe are the genuine breed of each of thoſe counties; but the graziers have mixed them more or leſs in each, though 'tis beſt to keep them ſeparate; their kinds and diſpoſitions being particular, as well as the colour.

The huſbandman muſt at firſt buy, but he is afterwards to breed; and in order to keep up the ſort with certainty, he muſt take care to have a right bull, and well ſized cows, both of the ſame breed. From this ſtock with a ſufficiency of rich paſturage, he will not fail to have either breed in any county.

The ox ſhould be tall, full bodied, ſhort jointed, and well put together in every part, ſo that one ſees their ſtrength. The hair ſhould be fine, and lie ſmooth.

The ſtrength of the ox is very great, and he has patience to endure fatigue; but he is ſlow, and muſt not be put beyond his natural pace. He will not work eaſily, if this be attempted, and fretting and hurrying throws him into diſtempers.

'Tis but in ſome parts of England they breed oxen to labour, but it is very profitable. They are to be fed as well as worked; and he who by hurrying them makes them liable to diſtempers, takes them off from the one, and makes them incapable of the other.

Oxen trained to labour, muſt be put to work at three years old, but they muſt be brought to it gently, as a young horſe; for if they be puſhed at this time, they are ſpoiled for ever.

Care muſt be taken to match thoſe well which are to draw together; for otherwiſe they draw unequally, and ſpoil the work and one another.

In this regard muſt be had to three things, their height, their ſtrength and their ſpirit; for ſome are tall that have not much ſtrength; and others have a great deal of power that are ſluggiſh.

In general they are tractable and gentle, but regard muſt be had to their ſeveral natures, for they will not be forced out of them; and they may be injured in the endeavour.

The pyed Lincolnſhire ox is the fitteſt for labour. He is naturally long bodied, and till put up to feed, is leſs fleſhy than any of the other good breeds; though he takes to fattening very readily with reſt, and a good paſture.

When young oxen are firſt put to work, care muſt be taken not to over-heat or fatigue them. They muſt be ſuffered to reſt in the middle of the day in hot weather, and the ſervant ſhould give them ſome hay: this will ſupport them in their labour, better than graſs. They muſt be well fed during the time of their labouring, for they will not do much if they be not kept in ſpirits, but in this there muſt be moderation: for there is difference between feeding for ſtrength and for fattening.

An ox for labour muſt neither be bare, nor fat: in the firſt caſe he will be weak, and in the other lazy. They ſhould be treated gently, for they may eaſier be beaten into ſickneſſes and diſorders, than into labour.

An ox may be kept to work ſeven or eight years; and in that time he will do the owner a great deal of buſineſs; but if ill managed he will be as ſtubborn as an aſs, and will not be fit half his time for ſervice.

Sometimes a young ox will prove ſtubborn and unruly; but this will generally be found owing to ſome bad uſage, for the creature has not that bad diſpoſition in his nature. When this happens he muſt be kept hungry; and be made to eat out of the hand: when he is brought to labour, he muſt be tied with a rope; and at any time when he grows faulty, he muſt be cheriſhed, and fed with a mouthful of hay by hand; bringing him by ſoft means to quietneſs, and a readineſs in performing his buſineſs.

For breaking a young ox to the field, ſingle out one of the tameſt of the old ones, of its own ſize; and yoke them together. Let them be put to ſome ſlight work, and ſuffer'd to do it eaſily and ſlowly: they will draw equally, and the young beaſt will become familiar to it. They will be apt to get into too ſlow a gait at firſt, but by degrees they may be ſpirited to be a little briſker; and after half a dozen times going out with this quiet beaſt, the young one muſt be coupled with an ox of more ſpirit, that will learn him to go quicker.

This is the only way to get the ox to his ſpeed; for at beſt it is not great, nor will he be brought to it by force.

The advantages of labouring with oxen are ſo great, that it is wonderful the practice does not extend farther. The ox of eleven years old, may be fattened as well as at any other time; and in the ſame manner if he fall lame, or by any other accident be ſpoil'd for labour, at whatever age, he may then be fed for ſale.

In this the ox has a great advantage over the horſe, which, when aged, or ſpoiled by accidents, becomes an entire loſs, and often a great one to the farmer.

The food of the horſe is alſo expenſive, but that of oxen is cheap. They require no oats: and they are little liable to diſeaſes: but though the ox does not require ſo expenſive food, ſuch as he eats muſt be good in its kind, and he muſt not be ſtinted. He muſt have rich graſs to go to, and good hay in winter.

The great uſe of the ox in labour, is plowing. They will work at this in the tougheſt ground as well as horſes, and do as much in a day. They do not ſerve ſo well for drawing of carts and waggons; and are not fit to be uſed in places where the roads are good.

The farmer would always do well to train up ſome of his oxen for draught, though it is better not to depend upon them entirely for that ſervice. Every farmer has occaſion both for carting and plowing: horſes are fitteſt for the former, and the oxen moſt profitable for the latter: therefore when there are more teams than one kept, ſome ſhould be of horſes, and others of oxen, proportioning the number to the ſervice. The farmer who keeps only two teams, will almoſt find it his intereſt to have one of them of oxen, and the other of horſes.

In clayey lands, the oxen are muſt uſeful; and in chalky countries leaſt. The chalk ſoon ſpoiling their feet.

In ſome places where oxen are uſed for draught, they yoke them by the horns, but this is awkward and troubleſome. The common way by the neck and breaſt is preferable.

When the farmer comes to a reſolution of keeping oxen for labour, let him provide for a proper ſupply of them; and ſee it be rather too much than too little, for it will be more to his profit to ſell what he does not want, than to buy for his neceſſary uſes. He ſhould rear at leaſt two oxen and two cow calves every year to keep up his ſtock; and put his old, or injur'd beaſts to fatten and ſupply their places from this breed. An ox, whether put out of the team for age or injuries, will fatten as well as at any other time, and afford as good beef as any other.

When the huſbandman buys in cattle to fatten, it ſhould be in ſpring, or in the beginning of October. Thoſe which are bought in ſpring will be fat in July, Auguſt, or September, according to the goodneſs of the ſoil, and the condition wherein they were bought. An ox that is very forward when bought in, and is turned into a rich paſture, will be fit for market in ten weeks; but there is no need every one bought for this purpoſe ſhould be haſtened to a market condition. The huſbandman ſhould ſuit his endeavours to his grounds, and to the beſt demand for the cattle: he may keep on fattening the whole ſummer months, and anſwer his purpoſe better for market, and for his land, than if he haſten'd up all he bought, or bought only forward ones.

Thoſe that are bought in at the beginning of October, will be fit for ſale early in the following ſpring. Theſe will fetch a good price; but the winter feeding of them may eaſily run away with what ſhould be the profit.

The method is to forward them before the winter ſets in hard; and then only to keep them up in fleſh during the hard time, with hay or turnips.

They may be thus kept in a condition for market; and will be ſure of fattening up with great eaſe very early in ſpring, to a certain advantage.

Another way is to purchaſe lean young oxen at that ſeaſon, which will pay for their winter keeping by their growth, and be ready to fatten up early in ſpring to full profit.

Another good time of buying oxen for feeding is in Auguſt, or the beginning of September. Theſe ſhould be got forward as ſoon as can be, by putting them into rich paſtures; and they will be ready for the winter ſale.

This is the beſt method he can take, who has rich paſture ground; for no other will ſupport the large and valuable breed. But he who has not this advantage, is not altogether to decline thus much of the grazing buſineſs; only he ſhould ſet about it in a different manner.

Let him buy in a number of young Welch heifers in Auguſt or September, and put them into the beſt of his ordinary paſturages. He is to take his chance whether they prove with calf or not, but either way they will anſwer.

If they prove with calf, he is to keep them till ſpring, and then he will ſell them to a good advantage, with a calf by their ſide, for the dairy. If they do not prove with calf, they will preſently begin to fatten upon his ground, which, though poor, is yet fine in compariſon of what they have been uſed to; and he will be able to ſell them out at a good account at Chriſtmas or in ſpring; at both which times meat is dear, and conſequently cattle fetch a price.

Theſe heifers will, to the huſbandman thus ſituated, anſwer the purpoſes of oxen; and he is not to complain they do not bring altogether ſuch a price; becauſe neither the cattle themſelves, nor their keeping, have coſt him ſo much.

The advantage will be the greater, in proportion as he has the convenience of hay, or turnips, which are the two foods for winter fattening of cattle; and his nearneſs to ſome large city, where the demand and the price will anſwer to the expenſive feeding of hay. About great towns they may let a beaſt eat two load of hay in a winter, becauſe the demand is certain, and the price is good: but this will not do in remote places.

Let him who buys cattle for fattening, take care in the choice, examining their bulk and ſhape, and the forwardneſs they are in at the time, and then proportion the paſture to the kind.

Thoſe that are intended to be kept up for a winter, or early ſpring market, muſt be turn'd out in September into the rowens, and till the weather becomes ſevere, they will not need any fodder.

Upon the coming in of hard weather, they muſt have ſome hay every morning and evening. This muſt be proportioned to what the ground ſtill affords. The more they find there the leſs they want of the ſupply; and the leſs there is, the more hay muſt be each time given them.

Froſts ſweeten graſs. The ſour graſs, which the cattle had left untouch'd, becomes palatable to them after two or or three nights of a large white ryme. They will eat this greedily; and it will make hay the leſs neceſſary, till the ſnow covers it, and they cannot get at it. At theſe times the foddering is to be largeſt, for otherwiſe they will, in a little time, loſe all the advantage they had made in many weeks.

For thoſe oxen that were bought in lean, and are not got into fleſh by the beginning of the hard ſeaſon, ſtraw will do inſtead of hay: and he ſhould begin with barley ſtraw, and then come to oat ſtraw, both which are good food, and will keep the cattle as they are, and in a readineſs for farther improvement, when it comes on eaſy terms.

Toward the end of winter, the whole product of the ground will be eaten, and the oxen muſt be taken into the yard. If the huſbandman have oxen in two conditions, the one that he feeds with hay, and the other with ſtraw, they muſt be put up ſeparate; and their food given in racks for them.

He often complains his cattle will not eat their fodder, when they are taken into the yard, though they did freely when it was given them in the field. This is generally owing to giving them too much at a time. An ox will eat heartily and freely out of the crib, till he has often breath'd upon it, and then what was left is diſagreeable to him.

The inconvenience is eaſily prevented by giving a little at a time, and often.

Let the yard be well ſhelter'd, and kept dry. Let there be ſtraw enough ſcattered about it, that the cattle may lie ſweet and warm, this will greatly aſſiſt in keeping them in good caſe. The expence is well employed, for what the ſtraw is worth will be many times over made up in dung. Their trampling this, with their dung and urine, converts it into a rich manure; and the quantity becomes very conſiderable.

Oxen to be fattened on land, may be turned in alone or with horſes; or they may be put into the paſtures firſt, and the horſes afterwards. But let the huſbandman take care of the time of turning in his oxen. Many think they ought to let the graſs be very well grown before theſe cattle are put to feed upon it; but they are miſtaken. There is not a greater diſadvantage, than the having his paſtures too high grown before he put the beaſts into them.

The ox does not love rank graſs. In this caſe they only nip the tops, and the remainder rots upon the ground. When graſs is grown too high in autumn it becomes ſour.

If it happen the farmer have in autumn, a paſture ground of tall graſs; let him firſt turn in his oxen in a proper number, and they will eat off the tops; they ſhould then be removed out of it. And horſes ſhould be turned in, who, not being ſo nice, will eat it down lower: after theſe he may feed it with ſheep, which will ſtill find a great deal, that the ox and the horſe had left.

If the paſtures be all of the ſame kind, and all of a proper graſs for feeding of oxen, ſtill let him frequently change their place, removing them from one cloſe to another. This gives the cattle a variety of food; and it gives every piece reſt to ſhoot afreſh after their eating. Their taſte will diſtinguiſh the growth where it appears to our eye all the ſame; and they will be pleaſed with removing from one ground to another. Each cloſe will ſhoot up with freſhneſs from their cropping, when it is quiet for a little time from the treading of their feet.

The huſbandman ſhould always purchaſe as large a breed as his ground will maintain; and by this management he will find it ſupport a better ſort than it would in the hands of a leſs ſkilful perſon. The ſize of the ox is a great article, for it makes great addition both in the fleſh and tallow.

Let the ox for fattening have a ſmooth forehead and a deep belly. The ſtrength of his joints is needed when he is firſt deſigned for labour.

Preference is to be given to the young: but if they be ſomewhat older, let the farmer ſee that they are healthful. Let him feed up his own breed for ſlaughter, if he uſes their labour till the beſt time of their working is over; but let him not buy them in for fattening at that age, without he bargain accordingly.

It is a good ſign of health that an ox frequently licks himſelf. For when they grow ſickly, they neglect themſelves, and their coat becomes rough.

But every thing is to be underſtood within moderation. This, which is in general a ſign of health, may be a diſeaſe. They will ſometimes lick till they cannot eat, for they ſwallow a great many of the hairs, and theſe will get together into a ball in the ſtomach. In this caſe the owner muſt waſh the ox with a decoction of wormwood. This taſte it abhors, and finding it on the ſkin, will be cured of licking.

Some cover the creature with his own dung, but this is a filthy way. The ox will often tire himſelf, to get this off; or utterly neglect himſelf, which will prove of as bad conſequence.

In examining how the ox proceeds in fattening, the ſure way is to feel the hindermoſt rib. If all be ſoft and looſe about that, 'tis a proof he is getting into fleſh. The part behind the ſhoulders in an ox, and the navel of a cow, are the parts to be examined, to know the encreaſe in tallow.

One thing more is excellent toward the fattening of cattle, and this is the bleeding of them at times. It ſhould be done once at leaſt, or twice during their feeding.

The cattle I have bought in ſpring, I always bleed as ſoon as I put them to paſture, which makes them take to fattening directly. In thoſe I buy in autumn I follow the ſame method, at the time of turning into good paſture; this not only helps their fattening but prevents diſorders. This is all I do with thoſe intended for the winter market; but for ſuch as were bought lean to be kept for growing in winter, and fattened up in ſpring, I have them blooded when they are bought in, and again early in ſpring, when they are going into the paſture for fattening.

My neighbours allow my beaſts are leſs liable to ſickneſſes than theirs; and I attribute it to nothing ſo much as theſe bleedings.

For thoſe cattle which I buy lean in autumn, for the ſpring market, I always mix ſtraw with the hay I give them. Barley ſtraw does better for this than any other; and the quantity I allow is one third part. This anſwers for thoſe beaſts as well as hay alone, and in the affairs of huſbandry every ſaving is to be regarded.

CHAP. XIII.

Of the cow.

WE have mentioned the cow in treating of the ox, as ſometimes it is convenient to breed her in the place of that kind; we now come to conſider her with her calf and milk.

Products from milk will be conſidered hereafter. We are here to treat of the creature herſelf.

The cow being chiefly intended for the dairy, care is to be taken in the purchaſing a right kind, for there is a vaſt difference in the profit of this animal, according to the breed.

They have large cows in all thoſe counties where they breed large oxen, but the ſize is not all that the huſbandman is to conſider; the quantity of milk is not always proportioned to the bigneſs of the beaſt; and that is to be his chief regard.

Welch and Scotch cows will do upon the pooreſt paſtures: and they will ſuit ſome who cannot riſe to the price of better kinds. They yield a good quantity of milk if rightly managed; but the fine kinds are the Dutch and Alderney: theſe are like one another in ſhape, and goodneſs, but the Alderney cow is preferable, becauſe ſhe is hardier.

The Dutch breed have long legs, ſhort horns, and a full body. They are to be had in Kent and Suſſex, and ſome other places where they are carefully kept up without mixture, and will yield two gallons at a milking: but in order to this they require great attendance, and good food.

The Alderney cow is like the Dutch in the ſhortneſs of her horns, but ſhe is ſtronger built, and is not ſo tender. She requires rich feeding; but is not liable to ſo many accidents, and is equal to the other in the quantity and goodneſs of her milk.

Of which ever kind they be obſerve the following rules in their choice. Let them have the forehead broad and open; the eyes large and full, and, except the Dutch and Alderney breeds, let the horns be large, clean, and fair.

They have, in ſome parts of Buckinghamſhire, a kind that have no horns, they call theſe the polled breed. Theſe are to be choſen by the breadth of the forehead; for their eyes are leſs full by nature, than thoſe of many of the other kinds.

Of whatever breed the cow be let her neck be long and thin; her belly deep and large. Her thighs thick, her legs round and well-ſhaped, and her feet large. See that ſhe have a large, good, white, and clean looking udder, with four well-grown teats.

Let the bull be of the ſame breed: and let them be of as large a kind as the paſtures will ſupport. But it is better to have a cow of a ſmaller breed well fed than one of the beſt in the world ſtarv'd.

The red cow it is ſaid gives the beſt milk, and the black cow is beſt for her calf; but this is fancy. The red cows milk has been long famous; and a calf of a black cow is accounted good to a proverb; but the breed is the thing of conſequence not the colour.

The cow that gives milk longeſt is the moſt profitable to the huſbandman; and this is moſt the caſe with thoſe which are neither very young, nor advanced into years.

The beſt time for them to calve is in the beginning of April, this is moſt favourable both for the calf and for the dairy.

The huſbandman ſhould know the time of his cows being to calve; and three weeks before that, to feed them better than uſual. They ſhould be put into a rich paſture, if there be a good growth of graſs any where; if not they muſt be well fed with good hay. This will be returned many-fold in the profits of the milk.

When a cow has calved let her be kept the firſt day and night in the houſe, and let her water be a little warm'd. She is to be turn'd out the next day, in the heat of the ſun; but ſhould be taken in at nights for two or three days following, and ſome water a little warm'd given her before ſhe is turn'd out in the morning.

In hard weather, cows that give a good deal of milk, ſhould be fed in proportion: this ſhould be with fine hay every morning and evening, when the ground is cover'd with ſnow; and at other times once a day, as there may be occaſion.

When a cow does not yield milk enough, to pay for a good feeding with hay, let the fodder be hay and ſtraw mixed; or if ſtill worſe, let it be ſtraw alone. But it muſt be oat ſtraw, for barley ſtraw dries up a cow's milk.

When there is a ſcarcity of hay, or the price is very high, let him give the cows in milk, malt duſt, ſcalded with boiling water. When it has ſtood to be almoſt cold, it is to be given in the manner of a maſh.

If the cow have this at times, ſhe may be fed with any kind of ſtraw; for this breeds milk ſo well, that the other food will not be able to dry it up.

About London they feed their cows with grains. This cauſes them to yield a vaſt deal of milk; but it gives it an ill taſte; and is unhealthful for the cow. Malt duſt is as cheap, and anſwers the ſame purpoſe, without danger of illneſs, or hurting the milk. A buſhel will laſt a cow a week.

In February, when the paſturage is eaten bare, the cows are to be taken up and fed with dry meat according to their quantity of milk.

Milch cows ſhould not be blooded unleſs there be preſſing occaſions, and in that caſe the quantity ſhould be moderate.

The difference between one cow and another, in the quantity of milk, is ſo great, that there can no exact rule be laid down for their management when feeding becomes dear; only in proportion to the profit, ſhould be allowed an expence in feeding. A cow may be kept in health, and fleſh, for much leſs than ſhe can be fed for the continuing to yield her quantity of milk.

The demand for the milk and for the cow, and the profit that may be at any time made by ſelling both, is to be conſider'd; for the ſame thing is worth much more in one place, and at one time, than another.

In the neighbourhood of London there is ſo conſtant a demand, that the cow-keeper, partly with his early and late rank graſs, partly with hay, and partly with turneps and grains, feeds his cows in ſuch a manner, that they are at the ſame time in their higheſt perfection for milk, and fit for the butcher. But this is not to be done elſewhere.

But the difference between the milk of theſe cows, and thoſe fed in the country, is very great. The grains make the milk poor.

The price of grazing ground about Loudon is very great, but this is well anſwer'd in the preſent article, by that of the milk. This poor milk being ſold at three-halfpence the quart, very bad meaſure, while in the country, but half a day's journey from London, 'tis a penny the Wincheſter quart; and in ſome places the milk quart is full three wine pints.

A cow in a good farming country, while in milk, is worth five pounds a year. This is reckoning her to yield about four hundred gallons in that time, which, with proper management, is a very fair computation.

If the whole quantity from a middling cow, be made into butter, there will be about two hundred weight a year; and there will be a value beſide in the ſkim'd milk cheeſe, and in the whey, which ſerves for the feeding of hogs. From this we ſee the importance of this creature to the farmer, eſpecially if he take care to keep her in tolerable fleſh all the time, ſo that upon a ſhort notice for fattening, ſhe may be ready for the butcher.

There is another uſe to which the milch cow is put in ſome places, and which ſhould be brought to account, that is, the ſuckling of calves. A good cow will ſuckle four calves beſides her own, and grains will then be a conſiderable article in her food, for a great part of the year. Tho' the milk from grains be poor, there is always a great deal of it; and, though bad for the dairy, it is very fit for the breeding up of calves.

In Ireland they compute a cow yields for the firſt ninety days three gallons of milk a day; for ninety days more one gallon a day; for ninety more about a quart a day, and after this ſhe is to be allowed about ninety days more dry.

This is the account of a poorer kind than ours, and in general a poorer paſture; but the price is leſs, and the rent of land leſs; ſo that all things conſider'd, the profit may be equal.

No huſbandman needs compute lower than this, the London account is the higheſt; and conſidering all things, the difference does not amount to ſo much, as might appear at firſt ſight. The huſbandman in general may reckon at a medium between them.

We have conſider'd the cow as feeding upon paſtures; but the cuſtom is become general of raiſing what are called artificial graſſes, ſaintfoin and the like, and is very beneficial.

Artificial graſſes feed the beaſt finely, and occaſion a great deal of milk, but they give it an ill flavour, which runs through all the things that are made of it, and reduces their price at market.

It is not adviſeable to feed the milch cow upon theſe, when there is other food for her. The huſbandman ſhould never do it upon choice; but he may be led to do it by neceſſity. In this caſe let him uſe his cows only for the ſuckling of calves. A cow that ſuckles four calves, beſide her own, in one year, will be worth five pound to the farmer: this is much the ſame with her common produce, any other way; and if ſhe ſhould be able to ſuckle five, the gain would be advanced five and twenty per cent. She is more likely to ſuckle five upon this feed, than any other; for it keeps her in heart, as well as cauſing abundance of milk: and in this caſe the ill taſte is no diſadvantage: the calves ſhew no averſion to it; nor is it taſted in the veal.

It is alſo adviſeable to prefer ſuckling, when the farmer's paſtures abound in ſuch natural graſs as gives a rankneſs to the milk. This is often the caſe, where the graſs is large and ruſhy, as in marſhy places. This food yields a great deal of milk, but with an ill flavour: the calves have no diſlike to it, nor does it hurt their fleſh either in taſte or colour.

As to cheeſe, there are ſome grounds where it cannot be made to any good account. Where good cheeſe is not to be made, that work ſhould be entirely let alone: in others the profits, conſidering every article, are about equal to thoſe reſulting from butter.

The dairy requires the niceſt as well as the richeſt milk: therefore, where the circumſtances will not allow of the cow's yielding this, her milk ſhould be always put to other uſes. Fine milk is the produce of ſweet graſs and good water. Where the food is rank, or the water bad, it will always have an ill taſte; and for that reaſon, if the paſture be ever ſo good, and the water bad, it is beſt for to ſet aſide all other thoughts, and uſe the cows for ſuckling of calves if practicable.

About London, where the cow is kept in fleſh all the time of her milk, and is any day of ready ſale to the butcher; as ſoon as ſhe begins to fail in milk, the way is to ſell her, and purchaſe a lean cow in the proper condition in her place.

In the country ſomething like this may be done; but more care and time is required for it.

One of the greateſt inconveniencies of ſucking calves is, that they keep the cow down by the quantity of milk they draw, ſo that ſhe is not ready to go to the bull again at a proper ſeaſon. The farmer's buſineſs after this is to fatten her for the butcher.

In the beginning of May, or the middle of Auguſt, ſuch cows ſhould be turned into a paſture for fattening. This will take up four months, they will be then of ready ſale; and if theſe ſeaſons are obſerv'd for turning them in to fatten, they will be fit for ſlaughter at a time when they bear a price. Thoſe which are turn'd in at the firſt named ſeaſon, are fit to kill in harveſt time; and the others a little after Chriſtmas.

The price for which a fatted cow is ſold at theſe ſeaſons, will purchaſe a milch cow with a calf; and pay for the time for her fattening. Thus the huſbandman muſt contrive and compute: all things muſt be taken into his conſideration. It is eaſy to get ſomething by it; but he who ſets to work upon it with diſcretion, will double his advantage.

CHAP. XIV.

Of the calf.

We have given the huſbandman proper directions for the choice of his bull, and cow, and he is ſo far inſtructed toward the breeding of the calf. But a great deal remains to be ſaid reſpecting its management: it may, in many caſes, be made doubly valuable by proper care. Various methods are uſed in raiſing calves, according to the demand; various means being employed to ſuit their fleſh to the taſte and eye in the markets. There are two ways of breeding thoſe which the huſbandman intends to rear. One is to let them run with the dam all the year; and the other is, that of taking them away when they have ſucked a fortnight.

In the cheap breeding counties, the firſt way is moſt uſual; and it is allowed to produce the faireſt, ſtouteſt and beſt cattle. It is done alſo with leaſt trouble to the owner. Theſe are inducements of conſequence, but there are in many inſtances, others on the oppoſite ſide that outweigh them.

When the calf is taken from its dam at a fortnight old, care is required in raiſing it: but in places where it is the common method, this becomes familiar and eaſy by uſe. They warm a quantity of flet milk, and teach them to drink it. This is moſt natural when of the ſame heat with the milk from the cow; and if it be much warmer, or much cooler, it is ſure to do the calf harm.

The calf, in a little time gets ſome ſtrength: it is to have milk given to it for a quarter of a year; and at the end of that time, water is to be put to the milk, and by degrees more and more till it be only water, and ſerve for drink, not for the ſole nouriſhment.

Before it is brought to this, the calf muſt be taught to eat dry food. This is done by putting ſome fine hay in a cleft ſtick, and leaving it in his reach. It ſhould be firſt put in his way when he is five weeks old; and he will ſoon take to it; ſo that by the time it is proper to wean him from milk, he will naturally feed on hay.

When the calves have got ſome ſtrength, the huſbandman is, in fair weather, in the middle of the day, to turn them out to graſs; they are to be taken in at night for a week, and ſome milk and water given them warm; and it is a good cuſtom to ſet a little to them in a pail in the field: till they are able to feed and take care of themſelves.

In the firſt turning calves out to graſs, care muſt be taken that it be a proper kind of paſture. It ſhould have a ſhort ſweet graſs.

The beſt way of all is to wean the calves at graſs; for when they are weaned in the houſe, they become ſubject to diſorders.

At three years old, ſuch of the male calves as are intended for oxen, ſhould be gelt.

In places where there is a quick demand, the beſt method is to fat all the calves for the butcher, except ſuch as are neceſſary to keep up the ſtock. This demand is largeſt near great towns, where the price of the calf is high, and the grounds are not profitable to breed upon.

As the price of the calf depends upon the fatneſs and colour of the fleſh, the care of the owner is to be turned to theſe two articles: in the which if he ſucceeds, his calf will fetch as large a price as a good heifer. The method is this. They keep them very clean, giving freſh litter every day, ſpreading the new upon the old; and always keep a couple of large lumps of chalk hung up in their reach; and where they cannot foul it.

The calf will lick theſe chalk ſtones, and their whiteneſs communicates itſelf to the fleſh.

In building of the coops in which calves are to be fattened; the two great conſiderations are, the keeping them cool and dry. They build them in places where there is little ſun; and raiſe them three foot from the ground, ſo that the urine naturally runs out.

When the calf is thus well fed, and carefully looked after, it is twice at leaſt blooded: once of theſe times is at about five weeks old, and the other a little before it is killed.

When a calf purges, the cuſtom is not to let it ſuck altogether, for the milk of the dam often throws it into this diſorder, which certainly waſtes its fleſh. They give it milk with chalk ſcraped into it: which has a double effect; ſtopping the purging, and throwing more of the whitening matter into the fleſh. They ſcrape the chalk very fine for this purpoſe, and after mixing it well with the milk, they pour it down the calf's throat with a horn.

When this will not remedy the diſorder, and the calf is like to be ſpoiled, they uſe the cold bath for it; and give it ſome bole armenick, and chalk mix'd up with milk into balls.

If this does not anſwer, the generality know not what to do farther. But I have found that in the worſt purgings to which theſe young creatures are ſubject, a ſmall doſe of diaſcordium made without honey, mixed with port wine and water made warm, and given with a horn, will do more good than all their remedies.

The calf muſt have no milk three quarters of an hour before, nor an hour after this drench, but it may lick as much chalk as it pleaſes. If this does not anſwer in the firſt doſe, another may be given twelve hours after, and that rarely fails. The quantity each time is a dram. This never hurts the colour or taſte of the fleſh.

The calf may be diſordered in the other extream, and that is full as bad. If it be coſtive, the fleſh of it will never be delicate. When this is obſerved, the method is to give a little manna; the beſt way is this: buy an ounce of ordinary manna, which they ſell at a ſmall price at the druggiſts; diſſolve it in a quarter of a pint of water, and add a ſpoonful of brandy. Thicken up this liquor with fine wheat flower, and make it into crams, give the calf three or four of theſe every morning after he has been ſucking, and dip them in milk to make them go down.

Theſe medicines might have been reſerved to a following part of this work, but as they concern the management of the calf for ſlaughter, I have ſet them down in this place.

The manner of bleeding calves is this. The firſt time it ſhould be done in the neck, and not too much. The ſecond is beſt done by cutting off a piece of the tail, and if this do not bleed ſo much as might be expected, it may be repeated at two or three days diſtance, by cutting off another piece, which will bleed juſt as the former.

One uſeful effect the chalk has, beſide the whitening, is, preſerving the veal: it keeps it dryer than it would otherwiſe be, and the wetneſs is what makes it ſoon taint.

The cow is ſubject to great irregularity in breeding of her young. Frequently there are parts of a ſecond calf growing out of the firſt; and theſe monſtrous productions are ſhewn about for their curioſity.

Nature often is ſo abundant, that the young come by twins; and we have inſtances of cows that have, for ſeveral years together, always brought forth two calves at a time, as if it were the natural condition of the animal. Dr. Plot, in his hiſtory of Staffordſhire, tells us of a cow at Dunſtall, that for three ſucceſſive times brought forth two calves each, and a fourth time three: having no leſs than nine calves in three years.

The bull was doubtleſs the ſame to this cow, and to others; whence we may infer, that in the caſe of twins in our own ſpecies, as well as other animals, the cauſe is in the female more than the male.

The ſame author tells us of another cow that had ſucceſſively three, two, two, and then three again, ſo bringing ten calves in the ſpace of time as the other did nine: the cow which brings an abundant number of young at any one time commonly continues to do it.

Moreton ſays, that when the twins are one male, and the other female, the cow calf, if it be brought up, is always barren. In that, and in ſome of the adjoining counties, they ſhew a kind of cows which they call free martins, they have large horns like an ox, and they ſay they partake of both ſexes. Theſe are ſaid to be the cow calves where they have been twins.

I have ſet down theſe articles, for the ſake of farther enquiry. Writers are too apt to take things upon report, and we know how idle many of the ſtories are, which are confidently and univerſally propagated among farmers.

CHAP. XV.

Of ſheep, and the ſeveral breeds in this country.

NEXT in value to the larger horned cattle comes the ſheep; an article of vaſt concernment to the farmer: cheap in the purchaſe; eaſily fed; and returning a great profit ſeveral ways: even its dung upon the land often pays for all it eats while fed upon it.

We have adviſed the farmer in the choice of his larger cattle, to proportion their kind to the richneſs in his land: ſheep are a ſtock for ſuch as will not ſupport the larger kinds. We ſee them thrive upon the moſt barren downs; and the farmer will find them fatten upon grounds which will not keep the other kinds alive.

As oxen are of different breeds, though all the ſame in kind, ſo it is with the ſheep, which differ extreamly according to the breeds in different places.

Great caution ſhould be uſed in the ſtocking a farm with ſheep: with reſpect to the breed, and in the choice of the creatures themſelves; for there are, in every breed, many that are much finer than others, and theſe he ſhould chuſe. Half the profit that might be made by this part of the ſtock, is loſt by careleſſneſs in the firſt choice: but which is irrecoverable, except by beginning over again. We ſhall lay before the huſbandman the properties of the different breeds of ſheep in England, and adviſe him in his choice according to his main deſign, his beſt advantage, and the nature of the land he has to ſtock with them.

As to the fineneſs of the wool, there is a ſmall breed, with black face and thin coat, that exceed all others. They bear but little, but the quality makes amends. Theſe are eaſily known by ſight. They were firſt raiſed in Herefordſhire and Worceſterſhire; and are known by the name of the Herefordſhire or the Worceſterſhire breed. A barren, and expoſed paſturage will feed this kind, for they are hardy; and the ſhorter the graſs, the finer the wool.

They are alſo excellent for the table. This kind is kept in parks and lawns, and they every where make a pretty appearance.

The kind moſt oppoſite to theſe are the large, tall, and heavy-loaded ſheep: theſe have ſtrong limbs, and a ſtout gait: they carry a great deal of wool, but it is coarſe. Theſe were firſt bred in Lincolnſhire, and in the adjoining counties; and are fond of living in ſalt marſhes. They have been taken into many parts of the kingdom, to other ground, where they do not keep to their nature; and yet are called the Lincolnſhire breed.

The fleſh is large grained, and no where very much eſteemed. However, as they ſucceed in places toward the ſea, it may be proper for the huſbandman who has land in ſuch a ſituation, to take ſome of them.

There is a breed between theſe two, which in general ſhould be prefered to either. This is a large, tall, and ſtrong ſheep, of the beſt ſhape of any, and having the deepeſt coat of wool. This was originally fed in ſeveral of our midland counties, and has thence been called the midland breed; and by others, from ſome particular counties, the Leiceſterſhire or Northamptonſhire breed. The wool, tho' not ſo good as that of the ſmall black faced ſheep, is preferable to that of the Lincolnſhire breed; and the quantity is ſo much greater than that of the ſmall kind, that it makes amends for the inferior quality.

The fleſh of this is the common mutton, not in any thing particular for goodneſs or badneſs. It will do very well upon the common paſture ground. Theſe ſheep ſhould be therefore moſt generally bred.

When the huſbandman has very poor paſture grounds, let him take the Herefordſhire breed; and when he borders upon the ſea-coaſt, or upon the ſhores of large ſalt water rivers, the Lincolnſhire kind: but when he has none of theſe reaſons let him prefer this midland breed.

Sheep bred in the northern parts of this kingdom, are large and big boned. They approach to the Lincolnſhire kind in ſhape; but their wool is harſh, rough, and hairy, theſe are called by ſome the Yorkſhire breed.

Their fleſh is inferior to that of the other kinds, as well as their wool; but they have an advantage, in that they will ſtand the coldeſt weather, and take care of themſelves where others would be loſt. This may recommend them to the huſbandman whoſe lot has thrown him far north, where the other kinds will not thrive; but he ſhould not introduce them into his farm in any other ſituation, for they are leſs profitable than the reſt.

The laſt breed to be mentioned, is peculiar to mountainous countries; and moſt frequent in Wales. It may be called the Welch breed. It is a ſmall, but well ſhaped ſheep; and ſo hardy that it will live any where. The fleſh is excellent for the table: but the wool is ſmall in quantity, and the worſt produced by any ſheep of this country.

The huſbandman will ſee it never can be his intereſt to admit this breed among his ſtock, unleſs compelled to it by the particularity of his ſituation. The little black faced ſheep of Herefordſhire has the ſame advantage in the excellence of its fleſh; and it has the fineſt wool in the world. Therefore it is highly to be prefered, where it will thrive: and it will do on very poor and very expoſed ground. However, if the farmer finds his paſtures ſo poor, ſo expoſed, and miſerable, that they will not ſupport this kind, all he has to do is to call in the Welch, which will live any where.

CHAP. XVI.

Of the choice of ſheep.

HAVING given this account of the principal breeds of ſheep, our next care muſt be, the inſtructing the farmer in his choice, not only of the breed he ſhall fix upon, for the grounds of that have been laid down already; but of the particular creatures he ſhall fix upon in the breed moſt ſuited to his purpoſe.

He ſees five kinds of ſheep, ſome large, others ſmaller; and ſome yielding a greater, ſome a ſmaller quantity of wool; which is on one breed fine, and on another coarſer. He has his choice among all theſe, for we ſuppoſe him not yet to have begun ſtocking his farm: it would be natural to prefer the fineſt kinds as moſt profitable; but every breed will not ſuit every paſture.

He has ſeen the kinds of ſheep: let him examine the nature of his land; and then fix upon that which will thrive beſt on ſuch paſturage he has at his command.

He will have more profit from the worſt kind that ſhall thrive upon his land, than he can from the beſt that ſhall ſtarve upon it.

Let him obſerve alſo the difference of the land to which he is to bring them, from that whence he purchaſed them:

this muſt be in favour of the land to which they are brought; for any breed will decline upon coming from a richer paſturage to a poor one.

Let the farmer ſee that he buy a kind ſuited to his grounds; from a worſe land than his own, for upon that will depend their immediate thriving.

Having ſettled the general points, let him proceed in the choice of each particular ſheep.

Whatever breed they are of, let them be ſtout, hearty, well made, and big boned: let him ſee the wool be ſoft to the touch, and fatty in the handling; and that it be clean and well curled.

Sheep of this condition, in whatever breed, bear the largeſt quantity of wool: and theſe are marks that make them bring a price at market. The butcher has his rules for judging as well as the farmer, and theſe are the things after which he principally enquires.

The choice of ſheep to breed is a material article. Let the ram be young, handſome, and well ſhaped, his wool clean and grow well; and the ſkin underneath of the ſame colour. Let his body be large and long; his forehead broad, round and riſing; his eyes be large and of a cheerful aſpect, and his noſtrils ſtrait and ſhort.

Sheep without horns, called the polled breed, are the beſt breeders.

Chuſe the ewe for breed thus; let her neck be large, but naturally bending like the neck of a horſe. Her back ſhould be broad, and her buttocks round: her tail ſhould be thick, her legs ſmall and ſhort; and her wool thick and deep.

To know if they be ſound, let him examine whether any of the wool be wanting: let him ſee that the gums be red, and the teeth white, the felt looſe, but the wool firm, the breath ſweet, aud the feet not hot.

Two years old is the beſt time to buy them at. They will bear good lambs till they are ſeven. Their age is to be known by their mouth. When they are one ſhear they have two broad teeth before; when two ſhear, they have four, when three ſhear, they have ſix; and when four they have eight: after this their mouth generally begins to break.

Nothing ſhews a bad condition more than the dullneſs of their eyes, and the looſeneſs of their wool. If theſe marks be upon them, they will never ſtand.

CHAP.

CHAP. XVII.

Of the breeding of ſheep.

THE rams and the ewes being choſen for breeding, the huſbandman is to conſider the beſt time for putting them together. More care is here recommended, than uſually is taken; but not more than is proper or requiſite. The huſbandman by induſtry and knowledge, may obtain much larger profits than the common run of perſons in this buſineſs are content with: although leſs care may do, he who uſes the moſt will have the largeſt gains. The farmer in every article of his buſineſs, ſhould conſider the event before he fixes upon the means; and always have the end in his eye when he is about to make a beginning.

Before he puts his rams and his ewes together for breeding, let him compute the time of their going with young, and when his lambs will be brought forth. Let him then ſee what ſeaſon will be beſt. Let him conſider at what time in ſpring his graſs will be fit to maintain the ewes and lambs; and put the rams and their females together ſo long before, that will bring the young at that time.

Let him conſider whether if they fall early he ſhall have turneps to ſupport them till the graſs comes; many a time the huſbandman, for want of timely care, has loſt both his ewes and lambs for want of food.

The conſiderate farmer is to take care he is ſure of a ſupport for the young and their dams when required; and that it be a ſufficient and good food for them. That which will keep them alive, will not always be ſufficient for their thriving. If there be a defect in either quantity or quality, the lambs will be ſtunted at firſt, and this they difficultly recover.

The ewe goes with lamb twenty weeks, and the beſt ſeaſon for them to yean is, toward the middle of April; except where there is very forward graſs or turneps. If on any occaſion, it is neceſſary to have them yean much earlier, they may be put together accordingly.

In this caſe there will require a great deal of care for the lambs for ſome time. They are very tender when firſt brought forth, and if they are not tended, magpyes will peck their eyes out: and the coldneſs of the ſeaſon keeps ſuch as fall in January or February tender and weak longer than thoſe which are brought forth at a more advanced time: and therefore a nicer care is required to breed them up; and it muſt be continued a longer time.

The beſt land to breed ſheep upon, when the farmer has variety, is to be judged by theſe qualities. A rich paſture breeds well ſhaped and tall ſheep, according to their kinds; ſuch as have ſhort graſs breed lower but well ſet ſheep. Thoſe which are bred in mountainous or woody places, are commonly ſmall limb'd and low.

Dry paſtures are the fitteſt for this purpoſe: wet grounds, and ſuch as are liable to be overflow'd, being hurtful; excepting only the ſalt marſhes, which, for the proper kinds, ſucceed very well.

Theſe rules are ſubordinate to thoſe more general ones, which have been delivered already. The breed of his ſheep is the great article in reſpect of their ſize, and he has been informed before what breeds ſuit what lands.

The farmer who is about breeding of lambs, ſhould ſave the graſs and weeds that grow in the lands he deſigns to fallow in winter; and turn his ewes and lambs into them in March.

When ſheep are turned into wheat or rye to feed, he muſt take care it be not too rank, for in that caſe it gives them purgings.

No cattle ſhould be fatted while they are going with young: they ſhould be kept then upon a moderate paſture, except the three laſt weeks. This is to be more carefully obſerved with ſheep than any other kind. If they be fed too high the whole time, it will go hard with them in yeaning; but if they are not put a little into heart before they come to it, they will want milk.

The beſt time of yeaning a lamb is at four months: but in general there need no caution to be uſed at all. Nature does this, and the owner knows nothing of it.

When the farmer has plenty of good graſs, and his rams always run with the ewes, he need not give himſelf any trouble about the weaning of the lambs. The ewe will go to ram of her own accord: ſhe will then become dry, and the lamb will be weaned naturally.

In paſtures which are ſubject to give ſheep the rot, it is beſt to let the lambs run by the ewes longer: theſe tender creatures are more ready to come to harm than the full-grown ones in thoſe unſound places: and ſucking is the beſt preſervative againſt it.

If the farmer have ſuſpicious paſtures, and finds his lambs want milk, it is beſt to ſell them: for it is not the running by the ewe that will preſerve them, ſhe can be of no ſervice, if ſhe wants milk.

Thoſe that are intended to be bred as rams, ſhould be ſeparated from the reſt, and the other gelt in time. Every creature bears this beſt while it is with the dam.

CHAP. XVIII.

Of the ſhearing of ſheep.

THERE are two articles in the condition of wool which enhance its price. Theſe are fattening and cleanneſs: and it is in the owner's power to give it theſe in a much greater degree, by his care. The firſt will be increaſed by the time of ſhearing the ſheep, the other by cleanlyneſs.

Fattyneſs of the wool never gives it any value unleſs it be alſo clean; and the cleanneſs will diſcover its imperfection, if it be not fatty.

The fattyneſs is owing to the creatures ſweating: therefore there muſt be ſome hot weather paſt before it is ſheared: it muſt have ſweated many days together, that the moiſture may have lodged itſelf about the wool, and in a manner oiled it ſo, that the waſhing for cleanlyneſs ſhall not carry it off.

Unleſs the ſheep have ſweated well before waſhing, that will do as much harm as good: for as much as it increaſes the price by cleanneſs, it diminiſhes it by taking off the fatneſs. It is neceſſary ſheep ſhould be well waſhed before they are ſheared: but unleſs they have well ſweat in their wool firſt, this will hurt it.

Upon this foundation depends the art of ſheep-ſhearing. The beſt ſeaſon is toward midſummer. But let the weather determine, and let not the farmer be carried away by the name of any day, or month, againſt the uſe of his reaſon.

June is commonly the month; becauſe at this time of the year there commonly has been ſome hot weather: and there follows hot weather after it. But if any year the ſeaſon prove very cold in the firſt part of the ſummer, let him defer it till July; and, if very hot weather come in early, let him go to ſhearing in May.

If the end of May be hot, he is to begin early in June;

and if the hot weather have not come in till the beginning or middle of June, he is not to ſhear his ſheep till the latter end of that month. We would not have our farmer oppoſe the common methods, unleſs where they are wrong; but underſtanding their foundation, he will often find it convenient to depart a little from them.

When he has on theſe principles ſettled the time of ſhearing for that year: the next care is to prepare for it by ſettling the time of waſhing the ſheep, and giving them opportunity to dry themſelves clean.

A good place of waſhing is to be fixed upon, and a piece of clean and dry ground in which they are to run till they be dryed. This, and the waſhing place, ſhould be as near as may be.

Though it is needful that the ſheep be waſhed before it be ſhorn; it muſt not be ſhorn while wet: and if ſuffered to run at random afterwards, and get dirt, the waſhing would not be of much effect.

The whole being thus underſtood, and all things ready, let the farmer proceed to the waſhing of his ſheep. Let him ſee this be done thoroughly and carefully. There is a way of ſlighting buſineſs in ſuch a manner, that it might as well have been let alone; and this is too common in waſhing of ſheep, which is a thing very troubleſome to do well. If the farmer does not ſee it done well, he will not be able eaſily to know afterwards, whether it be well or no.

The preſence of a maſter is always uſeful; but in no article more than this.

When every ſheep has been thoroughly waſhed, let them be all turned together into the ground deſigned for them, and there be left to run till they are dry. This will take two, three, or four days, rarely more, for the ſeaſon is ſeldom very unfavourable at that time of the year.

After this let the ſhearer get to work, let him be one who underſtands his buſineſs: for an ignorant or careleſs fellow at this work, may do his maſter more damage in one day, than a month's extraordinary wages would coſt him.

Let him over-ſee every thing with his own eye; and if he perceive any ſheep half waſhed when it comes to the hands of the ſhearer, let him ſend it to be waſhed again.

Let him ſee the ſhearer be careful not to hurt the ſheep, cut them, or prick them with the point of his ſhears: the ſlies will take advantage of theſe wounds, and torment the naked creatures to madneſs. Finally, let him ſee the wool be carefully taken off, and well wound up.

It is a good cuſtom to ſhear lambs with the ſheep. But he need not be very ſtrict and exact about it all over. The principal care is to ſhear them well behind.

Before they come to be ſhorn it is neceſſary to cut away the wool of their tails, and juſt behind, that the dung may not hang on it: this makes the creature ſore, and brings the flies. When they come to be ſhorn they ſhould be cut cloſe behind; but very little before.

Sheep damage their wool by lying in dirty places, for they are not naturally a cleanly animal. For this reaſon the wool of the ſame breed of ſheep, is much finer in thoſe counties where they houſe them at night, than in other places. In Glouceſterſhire, they houſe the ſheep at nights, and litter them with clean ſtraw. The expence is very well paid by their dung, which, together with their urine mixing among the litter, enriched alſo by their ſweat, and the fatneſs of the wool, makes a fine, rich, and precious manure.

The method of throwing in ſandy or other earths, to be enriched by the dung and urine of the animal, is better than this of ſtraw, when the article of manure only is conſidered; but taking the wool into conſideration, this by ſtraw is preferable.

From theſe methods, practiſed in different places, the judicious huſbandman increaſes his knowledge; and his profits in proportion.

He will now be able to determine upon a conduct in the management of his ſheep, which although built upon the practice of different counties, in ſeparate articles, is preferable, upon the whole, to any one of their methods ſingly.

If he uſe the covered fold, for the ſake of raiſing a quantity of manure with ſand and other ingredients, during the reſt of the year, he will do well to throw in clean ſtraw, by way of litter, for the four or five weeks before the ſhearing. This will give him a conſiderable advantage as manure, though not equal to what he gets the other way, and what he loſes in that reſpect, he will gain by the fineneſs of the wool.

Upon this principle the huſbandman may reaſonably have a kind of covered fold, ever ſo ſlight, on the ground where he turns in his ſheep, between the time of waſhing and ſhearing. Let him ſtrew this with clean ſtraw, by way of litter; and ſee the ſheep all driven into it at night. This they will very readily do, becauſe they will feel cold after their waſhing; and by this means, lying clean and dry, they will keep the wool very nice for the ſhearing. There is alſo a cleanlyneſs in the nature of ſtraw that will be a great advantage, for they will rub themſelves upon it to a clean bright hue in the wool, which it will not have any other way.

CHAP. XIX.

Of the breeding up houſe lambs.

THE price of houſe lamb, at early ſeaſons, is ſo conſiderable, that it may be well worth while for the huſbandman who is ſituated near large towns, to raiſe ſome for this purpoſe.

To this end three things are to be conſidered. Firſt, to have a proper kind of ſheep; ſecondly, to put the rams and ewes together at a right ſeaſon, and laſtly, to provide proper pens in an houſe for receiving and nurſing up the young.

There is a ſheep of the midland kind, but a little ſmaller, remarkable for naturally lambing very early. If left to themſelves they will bring forth about the middle of December; and, if properly put together by the huſbandman, they will come ſomewhat earlier. Theſe lambs brought forth in the dead of winter, may be reared at home, and will bring a price that will anſwer the trouble.

This kind of ſheep is bred principally in Hampſhire and Wiltſhire; and is known among the common people by the name of the wey-hill ſheep.

The huſbandman who finds from his ſituation, that he may have a demand for houſe lamb; and that he has conveniences for raiſing it, ſhould take his opportunity to buy ſome of theſe wey-hill ſheep at the beſt market; chuſing the rams and ewes, according to the direction laid down here for that purpoſe. Let him not leave their time of breeding to chance, but keep them ſeparate till a proper ſeaſon, and then put them together.

The ewes are to be fed in a paſture not too rich, for the greateſt part of their time; and three weeks before their lambing, they are to be brought into a richer: and as the time of their bringing forth is known, let care be taken of them, and of the lambs as they fall, that they be not hurt by the ſeverity of the ſeaſon.

The laſt care is the bringing them up for the purchaſe of the butcher.

Many arts are uſed; and different directions have been given about it, but the whole may be delivered in a few words; the huſbandman, upon the principles of good ſenſe alone, will find moſt of thoſe cautions might have been ſpared.

The whole care conſiſts in two articles, the keeping the lambs warm, and the feeding the ſheep in ſuch a manner, that they may ſupply them with a rich milk. Let him look to the lambs with due care, to ſee they are warm and clean; and feed their dams as he ought to do, and he cannot fail.

The ſeverity of the weather would deſtroy the lambs, if they were left to ramble about with the ewes; and the ſcarcity of food, would make them unable to fatten them by their milk; but good food will make rich milk, and a due portion will yield it in due quantity.

Sometime before the ewes are expected to bring forth, let pens be built for them, in an houſe that is warm, but not ſhut up cloſe.

As ſoon as the lambs are brought forth let them be put into theſe pens, and from that time watch'd and tended, that they may be always warm, dry, and clean.

The milk of the ewes now they have lambed, is to be enlarged and enriched, by giving ſtill better food.

The beſt is turneps; but where they are not in readineſs, the ewe, beſide her rich paſture, muſt have, at times hay, bran, and oats given her.

Theſe ſupplies do not enrich the milk in the manner of turneps; therefore he ſhould not fail to have them for the occaſion.

The ewes are to be brought into the houſe three or four times a day, to ſuckle the lambs; and, as thoſe young creatures are kept very clean and comfortably, and feed to their fill upon rich milk, and upon nothing elſe; they will fatten quickly, and their fleſh will naturally be exceedingly white and delicate.

The ewes thus fed, have plenty of rich milk, and the lambs ſucking to their fill, and being kept quiet, fatten upon it freely. As to the difference of ſeaſon they feel nothing of it; for ſo they be kept warm, it matters not whether it come from the ſun, or from their comfortable ſhelter.

The advantage land receives from the folding of ſheep is very obvious; but let the huſbandman take care he does not loſe more by the damage he does his ſheep, than he gets by enriching ſo much of his land.

Nothing tends more to give ſheep the rot, than folding them, when due care is not taken.

Sheep are to be put into theſe folds at night, in ſummer, but let him take care only to do it in good weather. Let him ſee they are not turned out in the morning, till the ſun has been ſome time up; and let him take care they are driven to a good feeding place; for otherwiſe, being hungry, they eat any thing; and thus, between cold nights and bad food, they often get the rot and periſh.

CHAP. XX.

Of hogs, their advantages and evils.

A GREAT recommendation of any animal, is the cheapneſs of its food, and this ſets the hog above almoſt any other: little is to be bought for that creature, and he conſumes very little of the ſtock, any thing contenting him that is eatable, though his appetite is greater than that of any of the kinds yet mentioned.

If food is to be raiſed purpoſely for the hog, it comes very eaſy; coleworts, and any other of the coarſer vegetables anſwer for this uſe: they grow any where, and are ſown with little trouble; and the worſt of them will fatten the hog; in which condition he ſupplies the family and the market, to a very good account.

The fleſh ſerves in a variety of forms, and when the more marketable parts are diſpoſed of, there remains a great deal for the family.

The refuſe of every thing ſerves them for food, whatever is thrown from the barn, the kitchen, or the dairy. If they be ſuffered to run free about, they will, in a great meaſure provide for themſelves; but this is not a profitable method. Our huſbandman doubtleſs is acquainted with that good old obſervation, that all that is ſaved is not got: while they get food for nothing, they waſte their fleſh by running about; and what is loſt in their value, is much more than is gained by the ſaving.

Having named the good qualities of the hog, it is proper

per to mention the bad: the farmer ſhould know the advantages and diſadvantages attending every kind, that he may purchaſe accordingly. Hogs are the moſt ravenous of all the creatures kept about houſes. They ſpoil and deſtroy more than they eat, if they are not kept with proper care; and their rooting up the ground is a troubleſome and miſchievous quality. No creature is more apt to break fences; and the miſchief he would do if left at large would be endleſs.

Theſe ill qualities, are to be guarded againſt; and in proportion as the farmer is in danger of being more hurt by them, and has it leſs in his power to prevent them by a proper manner of keeping, the more cautious ought he to be in the buying any large number.

The way is to prevent theſe accidents, by keeping the hog up. In running at large he waſtes his fleſh; keeping them penn'd up is beneficial, not only with reſpect to their fleſh, and its profits, but to the dung; for whatever is thrown to them, that they do not eat, they trample to pieces, and being mixed with their dung and urine, it becomes manure.

In places where it is not convenient to keep them encloſed, their rooting up the ground is to be prevented by putting rings into their noſes, and their breaking fences by their being yoaked.

Theſe are the remedies for the evils, and the huſbandman who has already ſeen their good and ill qualities, will judge according to the circumſtances of his farm, whether it be convenient for him to engage in the feeding many of them or not.

CHAP. XXI.

Of the ſeveral breeds or kinds of hogs.

IF any one determines to keep ſwine in large numbers, let him be careful in chuſing his kind. There are not ſo many breeds in ſwine as in ſheep and oxen, but there is a great deal of difference.

The principal breeds are three, 1. The wild hog, which is ſmall, but hardy: it will feed upon leſs than any other, and its meat, though leſs in quantity, is preferable to that of any other. 2. The common hog which is larger, longer legg'd, and bigger boned than the wild, and affords an excellent bacon: and, 3. The low big bellyed hog, which is of late become very common in moſt parts of England. This lives cheap, is leſs miſchievous than the others, and breeds very faſt. But it is inferior to the common ſwine in its advantages to the farmer, all things being conſidered.

The low hog is to be choſe by thoſe who live in and about large towns, to run about the ſtreets, where it takes care of itſelf, and does better, being of a quieter diſpoſition than the others: the farmer in the country is to chuſe the common hog, being the largeſt in its growth, bringing forth a ſufficient number at a litter, and being eaſily fatted for the ſervice of his family, or for market.

In ſome counties theſe creatures thrive better than in others, particularly in Hampſhire, Leiceſterſhire and Warwickſhire. It will be prudent, if it can be done with convenience, to buy hogs for breed from theſe places; and let the purchaſer be particular in their ſhape.

Let them be choſen with long and large bodies, deep ſides and bellies, and very thick thighs; let the neck be thick, the noſe ſhort, and the chine full and well ſet with large and ſtrong briſtles.

When the farmer has a proper kind of hog for ſtocking his yard, let him be careful in ſuiting the number to the extent, and to the quantity of the proviſion he will be able to ſupply them. He muſt take care, that he do not take in too many; for no creature breeds faſter, and if he does not uſe moderation, he will be over-run with them.

The great increaſe depends partly upon the number the ſow brings forth at a litter, and partly from the ſhortneſs of the time ſhe goes with young. One of theſe creatures will have four litters in a year, and they will bring from eight to twenty at a time.

When a ſow brings more than ſhe can raiſe, they muſt be put to other ſows, if there be any in the yard in a proper condition to ſuckle them; if not, they muſt be deſtroyed, for there is no other way of rearing them.

The more hogs there are in a yard, the more ravenous they are, for they grow greedy by obſerving the eating of one another: and if there be not ſufficient food at the time when they give ſuck, they will eat up one anothers young, or even their own: ſo that great care is to be taken, that more are not received in than can be fed.

Let the farmer chuſe the largeſt and ſtouteſt of his pigs for the continuing the breed: one rule of judging early of their qualities, is obſerving which ſuck the foremoſt teats: they all aim at this, and the ſtrongeſt get them.

After the proper number of the beſt and ſtrongeſt pigs are choſen out to be reared for breeding, ſuch as are not diſpoſed of while pigs for the ſpit, are to be gelt or ſpayed according to their ſex. This increaſes their fat.

Great quantities of hogs are raiſed by the brewers, and malt diſtillers, becauſe of the convenience of their grains; but of this more need not be ſaid here, the method being known and eaſy, and now delivered among the rudiments of thoſe profeſſions to ſuch as learn them. They are kept clean and well fed, and nothing more is required to their thriving.

There are two ways of managing the fleſh of the hog for ſervice; the one for pork, and the other for bacon. According to the choice of theſe, the age of the creatures is to be different. Nine months old is the proper age of the hog for killing for pork, and the fineſt time for bacon is when they are a year and half.

The ſtouteſt and beſt pigs are had from ſows of three, four, or five years old, but they will begin to breed at one year, and continue till they are ſeven; the three years I have named are the prime. The boar ſhould not be leſs than two years old, nor more than five.

He is no loſs at the end of this time, he may be ſold for brawn, if an opportunity offers; if not, he may be gelt, and will fatten very well: nor does the operation, though performed ſo late, do him any harm.

Prudence is required in the managing this creature. An error any way in reſpect to their food, is very prejudicial: for the general courſe of their lives it matters not much what it is, but due care muſt be had about the quantity. If they are allowed too little, they will be ravenous and miſchievous, and if they are fed too plentifully, they will not be healthful. They ſhould be kept in heart and ſtrength by moderate feeding, till the time they are to be fattened up for killing; and on this article depends a great part of the profit that ſhall ariſe to the owner.

CHAP. XXII.

Of the feeding of hogs.

THE beſt method of feeding hogs is to keep them for the moſt part in the yard; their food ſhould be waſh every morning and evening: diſh-water with grounds of drink, and a few grains or other offal: for the reſt of the day they may be ſuffered to graze, in damp ſedgy grounds, and the refuſe of the garden is to be thrown to them in the yard.

Hogs feed excellently in woods, and under hedges in autumn, when the wild fruits are ripe and falling: they eat every kind; hips, haws, ſloes, acorns and beechmaſt, and theſe are a natural and excellent food. If hogs could be fed thus conſtantly, their fleſh would be ſweeter and better taſted than it is in the common way of fattening; but in ſome places there is little of this food: it falls out only at one ſeaſon of the year; and the creature is not well to be truſted. When all things concur, the fleſh of a hog thus fed is excellent: ſome think this food alone will not give firmneſs to the fat, but experience ſhews they are miſtaken.

When hogs are to be fatted in the ſtye, cleanlyneſs is a great article. They muſt alſo be fed often, and not too much at a time: their ravenous appetites will always lead them to eat more than they can digeſt. Their food muſt be freſh and good; they muſt have as much freſh and ſweet water as they chuſe to drink; and they muſt be kept quiet. In this manner they will fatten ſoon and well. Their fat will be firm, and their fleſh well taſted.

Nothing anſwers ſo well in all reſpects for the fattening of hogs as the fruit of the wild trees; they have air and exerciſe while they get it; and they live clean. Theſe are great reaſons, but where there is not a convenience of getting this food, or the ſeaſon of the year does not ſuit, the way is to fatten them up altogether in ſtyes, and this is to be done with peaſe: when they happen to be dear, the meal of offal corn will anſwer the purpoſe: theſe are to be mixed up with whey or ſkim milk, or milk and water, and the creature will never fail to fatten upon any of them.

It will take about a month to fatten a hog in this way, ſuppoſing him to have been in that midling condition before, which we have recommended for the ſake of his health. Peaſe are prefer'd to the other foods; and there is ſuch an opinion of their effect in giving firmneſs, and a clean taſte to the fat of the bacon; that when they happen to be dear, although the hog be fatted up with the other things, they generally give him a good quantity of this food the laſt week.

Hogs eat the buds of many trees, particularly the aſh and ſycamore, and it is a practice in ſome places to beat down ſycamore leaves for their food, upon which they will fatten.

Grains fatten them quickly; and often when they will not thrive with any other food, theſe will bring them to themſelves, and they will afterwards fatten upon any thing.

The way hogs are fatted in ſome places, for the navy, is excellent; and where there are conveniencies for it, ſhould be followed by all who deal in theſe creatures. They take in a piece of ground by the ſide of a running water, hedging in part of the water that there may be a place for the hogs to drink without danger of their eſcape. They ſtack up a quantity of beans and peaſe in this incloſed piece of ground, and turn in as many hogs as the quantity of food will fatten. They let them live at eaſe and liberty one among another, cutting down the ſtacks as they are wanted. Thus having plenty of food and water, and room and quiet, they fatten excellently.

As the hog is often apt to waſte its food if too much be given at a time, they have a contrivance in ſome parts of Oxfordſhire to prevent this, and at the ſame time to ſave the trouble of that conſtant attendance, which is required in feeding them with ſmall quantities at a time. They place over the ſtye a veſſel like the hopper of a mill, and into this put as much beans, peaſe, or other dry food as will fatten ſuch a number of hogs. From this there comes a large ſquare pipe down half way of the ſtye, through which the food continually deſcends out of the hopper. This pipe terminates at that diſtance in ſix ſmaller pipes, each of which ends in a little trough, no bigger than juſt to admit the noſe of the hog; and they come all of them with their ends ſo near the bottom, that there is never above a handful of the food at a time in each trough. When this is taken away by the eating of the hog, there follows ſo much more. This prevents their waſting the meat, at the ſame time that they have a conſtant ſupply: and if it happen from the convenience of the place, that a ſmall current of water can be brought through the ſtye, they will in this manner be fatted with leſs trouble, than in the way already mentioned of ſtacking the beans and peaſe for their ſervice.

The inconvenience from hogs rooting up the ground, has been mentioned; and the common method of preventing it, by a ring in their noſe; but as this is often ineffectual, and a great deal of miſchief may be done unexpectedly by theſe creatures, we ſhall propoſe, to the imitation of the farmer, a method much more ſecure, which has been long practiſed in Staffordſhire.

Inſtead of the ring they uſe a forked iron, armed at each point with a fin like the half of an arrow head. This being thruſt through the edge of the hog's noſe cannot be got back, and they cap the bottom or ſquare part of the fork that lies upon the noſe with a long and hollow ring, which turns round upon it. So that the creature can never take hold enough to turn up the earth. This is very eaſy, and it ſhews its own uſe. The damage hogs do by rooting up the ground is ſufficiently known; and many have found how unfit the common method by rings is to prevent it.

The method of feeding hogs on clover, has been mentioned in another place, when we were ſpeaking of the dung as a manure; and ſomething farther may be properly added here. Clover is an excellent food for the hog, but it is beſt not to make it the only kind, for it is apt to give a yellowneſs to the fleſh, which hurts it in the market. The beſt method of giving hogs clover is, at the ſame time that they are feeding at other hours on different things. Let them be turned out of the ſtye without their breakfaſt of waſh in the morning, that they may have a good ſtomach for the clover; and at the right ſeaſon let them be driven into the field with the horned cattle. At evening let them be brought home, and fed with waſh mixed with grains or corn, or let them have inſtead of the waſh, a great deal of ſkim milk or whey.

Bran and pollard fatten hogs ſpeedily, but the fleſh is not firm; nothing for this purpoſe anſwers like the pea or bean; a great variety of food might be mentioned for a creature that will eat any thing, but there are none of them come up to theſe, which are natural to the animal.

The diſtillers waſh and grains feed them up quickly, but there is a great difference between the bacon and pork fatted by that means, and ſuch as are fed on the natural fruits of trees or pulſe.

The ſame kind of food is alſo excellent, given properly, and in due quantity for the feeding of pigs: at their firſt weaning, the beſt food is ſkim milk, whey, and the artificial graſſes. After a week or ten days, it will be proper to add bran or grains to the whey or milk; and ſoon after this they may have peaſe and beans in moderation, and this will encreaſe their growth, and make their fleſh better. After this, if they have been pig'd in an early ſeaſon, they will come in for a ſhare of the ſtubbling and beechmaſt which will raiſe them beyond expectation.

A great advantage in this reſpect is owing to the ſeaſon of their being pig'd; the ſpring, or early in ſummer, is the beſt time for thoſe intended to be brought up; ſuch as are farrowed near winter, if ever ſo much care be taken of them, grow ſlowly, they are often ſtunted; and they are always more ſubject to diſeaſes than thoſe which come at a more favourable time.

CHAP. XXIII.

Of goats.

THE goat is not to be ſet upon an equality with the ſheep or ſwine, but there is an advantage attending it which none of the others have: this is, that it will live where neither ox, ſheep, or even hogs can. The goat ſhould be bred in all ſuch places, for the profit is ſomething; and it is the only kind that can be had.

The goat will feed in common paſtures, but there it is not worth while to breed them; for ſheep of one kind or other will live there; and the worſt kind are greatly preferable to the goat in profit. The goat is apt to crop young ſhoots of trees and ſhrubs, and in this reſpect may eaſily do more miſchief than he was worth.

Theſe are ſufficient reaſons againſt breeding this creature in common grounds, but where there is hilly, barren and uſeleſs land, 'tis every one's intereſt to raiſe the goat; for it will walk at eaſe where any other animal would break its neck, and feed where other kinds would ſtarve.

The natural ſoil and ſituation is a barren, rocky, and craggy mountain. Theſe places produce briars, and other ſmall ſhrubs, and upon the ſhoots of theſe goats browſe with the greateſt ſatisfaction.

In general the food of goats is ſuch, as is of no uſe to any other creature; and they are to be bred with little care or trouble. For theſe reaſons I would adviſe every huſbandman who has barren, buſhy, and rocky high ground, to keep them: and that he may make the greateſt profit from them, I ſhall lay down ſome obſervations which I have received from a worthy correſpondent upon the borders of Wales.

There is leſs difference in goats than among moſt other kinds; yet for the farmer who intends to bring them to a new place, the following conſideration ſhould be obſerv'd.

The beſt goats are thoſe which are ſtrongeſt limbed, and largeſt bodied: let them be choſen for breed, big made in every part, and covered with a deep ſtiff hair. Let their joints be firm and ſtrait, the neck ſhort and thick, and the head ſmall and ſlender, with full and large eyes, and long ſtout horns. The colour is not material, but in general the black goat is the ſtouteſt, and a long beard is a ſign of a good kind. Pyed goats are ſuppoſed to bring forth the fineſt and beſt taſted kids, but this is not certain.

Goats being thus choſen, the next care is putting them together for breed. No creature is ſo ready for copulating. The beſt ſeaſon is toward the middle of winter. The he goat ſhould be from two to five years old: he is beſt if about three or four; and the ſhe four, five or ſix. The he goat wears himſelf out by his frequent copulation, and is enfeebled by age at ſix years old; after which time his young are poor.

The ſhe goat is troubled with few diſtempers, and is a free breeder; they will bring forth twice a year, and they have ſometimes two, and ſometimes three kids at once.

The goats ſhould be kept in herds or ſmall flocks; and though they are hardy, it will be a great advantage to them if they have ſhade in ſummer, and ſhelter in winter: But this laſt muſt not be carried too far: if they be houſed in the hardeſt time, they ſhould have no litter for that will make them too hot: they are uſed to hardſhip in their natural way of living, and nothing is ſo likely to do them miſchief as too much tenderneſs. Cleanlyneſs is a great article when they are houſed, for as they are uſed to ſweet air, and are in themſelves very rank; if they are kept hot and frowzy, they fall into diſorders.

Nothing will require a ſtricter care, than defending trees from them.

It is enough for the defence againſt other animals, to train them up ſo that the branches ſhall be above their reach from the ground, but the goat will climb old trees, particularly the elm, of whoſe young ſhoots it is fond, and will browze for days together among the young branches.

For this reaſon as barren and rocky grounds, are fit places for them, they ſhould be confined to theſe alone. Otherwiſe they will ſoon do more miſchief than they are worth.

Keeping them in bounds, is not difficult; and there are a great many places in England, where a conſiderable profit might be made by breeding them.

The advantages from the goat are four. The milk, the fleſh of the kid, the ſkin, and the hair: the two latter are leſs regarded.

The hair is uſed for twiſting into ropes, and will never rot in water. In ſome places it is wrought into a kind of cloth for apparel.

The ſkin is dreſſed into a very good kind of leather, in ſome places, though altogether neglected in others. Goats milk is of the nature of aſſes, reſtorative in conſumptions, and for decayed conſtitutions; and in ſome counties they make good cheeſe from it: in other places, where the ſtock conſiſts partly of goats, and partly of cows, they mix goats milk and cows together, and this way it yields a very good kind of cheeſe, according to the common way of making. This is the practice I ſhould adviſe to the farmer who keeps goats. There is ſcarce any place where he may not upon the better pieces of his ground, keep ſome cows, and the goat's milk anſwers much better, and is managed much more eaſily for cheeſe in this mixture, than alone.

The fleſh of the goat is rank, and unwholeſome, but kid is a fine meat, little inferior to veniſon; and as the kid is eaſily had, and rear'd with little trouble, were there no other reaſon for keeping of goats, this were ſufficient. People that are delicate about the fleſh, rear kids for the table, as we have directed for lambs; but, with the leaſt care imaginable they grow to an excellent condition, as they run wild after the dam.

CHAP. XXIV.

Of the rabbit in general.

THE rabbit is very well worth regarding, as a part of the farmers ſtock. It will thrive where nothing elſe can live; and has a great encreaſe by young.

Both the buck and doe rabbit are eager for copulation, and they muſt not be reſtrained. The does go but a month with young; and as ſoon as they have brought forth, they are ready to copulate again. When they run wild they get together in a very little time; and when they are kept tame and ſeparate, they muſt be put together ſoon after the bringing

ing forth, otherwiſe the doe grows ſullen, and will take little or no care of her young ones.

The rabbit is of two kinds, wild and tame. The wild runs looſe, and burrows holes in the ground, and the tame is kept in houſes, huts, or boxes.

Both kinds yield a large profit, though under different management. The wild rabbit breeds faſt and freely in warrens, where there is room and a free air. They will thrive upon the pooreſt and barreneſt ſoils; in theſe grounds the farmer will find advantage from the breeding of rabbits, either altogether or occaſionally: in the latter way they improve theſe barren lands extreamly, by their dung and urine, and render the worſt of them fit for raiſing crops of rye; and ſuch as are but a little better, for the other kinds of corn.

The diſtinction between wild and tame rabbits is not founded in nature, but on our own practice; for the wild kind may be as well kept tame as the others. They are uſed to a kind of impriſonment in their holes, and for that reaſon they bear confinement better than other creatures.

CHAP. XXV.

Of the wild rabbit.

THERE is properly but one breed of the wild kind; and all the direction needful in its choice is, that ſuch as are taken to begin a ſtock, be large and big bodied, with a good deep fur that hangs faſt upon their backs, and with ſtout limbs. The huſbandman that has waſte ground fenced well, and not with live hedges, ſhould never omit this part of his ſtock.

A ſmall number is ſufficient to be firſt turned in, for of all creatures uſeful to mankind, they are the greateſt breeders.

The wild rabbit ſucceeds better in ſome places than others; the young growing up much quicker, and the fleſh being finer: the reaſon of this is to be ſearched in the ſoil and produce; and this may teach the huſbandman on which grounds to breed them.

The ſhorter the graſs, the better is the taſte of the rabbit. The drier the ground the better they ſucceed.

Of all creatures, water is the leaſt neceſſary to the rabbit: tame ones will live altogether without it, on moiſt food.

Where the ſoil is dry, the air fine, and the water that there is in the way is running and clear, rabbits may reaſonably be expected to ſucceed beſt.

The wild rabbit will very freely be kept tame; and thoſe which we uſually underſtand as tame rabbits, will live as well wild, eſpecially the hardier kinds. This is of conſequence, becauſe one of the tame kinds is better than the common wild one. This is the ſilver-hair'd rabbit. It will live and thrive as well wild as the common ſort; and it is always better taſted and fairer to the eye, ſo that it brings a larger price. The ſkin alſo is of more value, and the demand for it among the furriers is certain.

In many caſes it is adviſeable to breed this wild inſtead of the other: but though it often is ſo, it is not always. This, though as hardy, requires a better ſupply of food than the other; and will be poor, and of little value upon thoſe barren and heathy lands, on which the common wild rabbit ſucceeds very well.

The beſt place for this kind is a park, where it may run at liberty among the deer, and where there is good graſs, though not rank: the other is the fit kind for the pooreſt lands.

CHAP. XXVI.

Of the tame rabbit.

TAME rabbits are diſtinguiſhed according to their colours; but the differences are not great, nor is there any material difference attending the choice of one or the other ſort.

The ſilver-hair'd rabbit, is a very profitable kind to be kept tame: The Dutch is a larger kind, and is very good for the table, but the ſkin is of leſs value. The moſt beautiful, when kept cleanly, is the white long-hair'd kind, by ſome called the Turkey rabbit; and by others the ſhagge; but if not kept very clean, it is ſubject to a diſorder not unlike what doctors call the plica polonica; the hair growing together in clots and cakes, in ſuch a manner, that blood veſſels from the ſkin run up amongſt them, and they will bleed on being cut off.

It is not material which of theſe, or of the other kinds it is a cuſtom to breed at this time, the farmer chuſes: with proper management, any of them will turn to good account; but which ever ſort it be, let him take ſtrict and critical care in the choice: for a great deal depends upon it in this kind. The ſkin is of conſequence, and the diſtinction in this are nice, and they are never too much to be regarded in the choice for breed.

In the ſilver-hair'd rabbit, let the huſbandman take care to chuſe his buck of the true kind and colour. Let the fur be thick, deep, ſmooth, and gloſſy; and let the ground colour be black, with a moderate quantity of white hair. It is beſt to chuſe them rather dark, for breeding, becauſe the colour in the young is more apt to grow paler than deeper; and a ſilver ſkin that is too dark, always will bring a better price than one that is too light.

Let the fur of the ſeveral other kinds be examined alſo, when they are choſen for breeding: the largeſt and beſt ſhaped ſhould be fix'd upon. In the ſame manner, let them be picked out from time to time for keeping to preſerve the breed.

There are ſeveral methods for breeding and keeping of them. Some allow more and ſome leſs liberty to the animal: in general, ſuch as allow moſt freedom, even in this way, and moſt air, are beſt, for though the rabbit will bear confinement, yet it will thrive beſt where that is leaſt ſtrict.

Cleanlyneſs is a great article: and where the confinement is leaſt ſtrict, there is naturally leaſt foulneſs. The dung and urine have a diſagreeable and rank ſmell; and nothing prejudices the creature more than being kept naſty.

The general way of keeping tame rabbits is in boxes: others keep them in pits; but it would be a much better way to have buildings made for that purpoſe. This might be done at a ſmall expence, and they would be cleanlier and more wholeſome than any other way. Boxes are too ſmall, and apt to grow naſty, and pits are liable to be damp, which is one of the worſt things that can happen in a place where rabbits are to breed.

The boxes ſhould be made of thin wainſcot, and divided into larger and ſmaller rooms, two for each rabbit. One for eating, and the other for lodging and bringing forth the young. That for eating ſhould be the larger, and ſhould have a grate before it for light, and the ſmaller ſhould be entirely dark. Before both there muſt be placed a trough, with the food; and thus the creature will live, thrive, breed, and fatten. But there wants free air, and it is very difficult to keep them cleanly.

Thoſe who uſe boxes, ſet them one above another, in ſo many ſtories; and keep the bucks, and the does by themſelves; unleſs it be ſuch does as have not bred; and with thoſe they lodge a buck in the ſame box. The common ſize is two foot long, the ſame in breadth, and a foot high. It is ſurprizing to ſee a rabbit live ſo well in this ſmall compaſs; but it will always do better when it has more room.

The method of keeping them in pits, is thus. A dry ſoil is to be fixed upon, and the pit is to be dug ſeven foot deep, and of a bigneſs proportioned to the number. This muſt be walled up on the inſide, only leaving ſpaces for them to make their burrows. A ſandy ſoil, not too poor, is better than any other. At one end an hollow place is to be made for the buck to reſt in, he muſt be chained to a ſtump, and have room only to go to the rack where the food is placed in theſe pits, and thence to his den. In other parts of the pit, out of the reach of the buck, are to be the places left for the does to make their burrows. The rack is to be plac'd near the middle of the pit, between the buck and does, he being on one ſide, and they on the other.

Three does may be kept in the ſame pit with one buck, and for this purpoſe it ſhould be ten foot ſquare. Some make them larger, and keep more bucks than one, but it is a better practice to make more of them, only allowing one buck and three does to each.

This will appear a large proviſion for three or four rabbits, but it very well anſwers the expence. They live more comfortably than the other way; and the produce is ſo great that one buck and three does will bring a hundred and fifty, two hundred or more young ones in a year.

The young are to be left under the care of the dam, till they are a month old, and they are then to be taken from her either for ſale or the table.

The ſame practice is to be obſerved in removing the young, if they are kept in boxes, or whatever other way. When the old ones have brought forth a ſecond brood, the firſt is to be taken away, and reared up elſewhere. The common way is to remove them to other boxes, keeping thoſe of ſeveral broods of about the ſame age together: and thus they are to be treated in the other way, either rearing them in another pit, or in any manner that is convenient, only allowing them ſome room and air.

The reaſon of chaining up the buck rabbit in the pit, and keeping him ſeparate in a box, is his miſchievous diſpoſition, for he will kill all the young ones. This the does are ſo ſenſible of, that in their natural wild life, they hide the young ones, and cloſe up their holes, that the buck may not find them.

The two great requiſites in the pits are warmth and dryneſs: their depth, unleſs the ground be very favourable, making them ſubject both to damp and cold.

The moſt profitable time of their breeding is in the depth of winter; and they will never breed at this ſeaſon ſucceſsfully, unleſs they be kept dry and warm.

CHAP. XXVII.

A profitable method of keeping tame rabbits.

FROM the danger of the cold and damp in pits, and the want of air in boxes, I have been led to think of ſuch other methods as may give the rabbits the advantage of both in a fit degree, and yet keep them in ſuch an eaſy and ready way, that they may be always at hand, eaſily fed, tended, and looked after in every reſpect, and yet have warmth and freedom.

To obtain theſe advantages, by means of which tame rabbits of the beſt kinds will be kept in the greateſt perfection of health and beauty, let the huſbandman erect a building purpoſely for them.

Let him fix upon a proper ſpot of ground for his edifice, and draw the plan of it of ſuch extent as to contain the number he thinks proper to keep.

Let the ſoil be a dry loam; for this is the ſort of earth the rabbit loves beſt, and in which it is always moſt healthy.

Let the building be ſquare, and run up of wood in a ſlight but yet tight manner; and let there be a kind of cloſet carry'd up at one end.

In each corner of this ſquare let there be a den for a buck rabbit, and a ſmall poſt driven in, to which to faſten him by a chain, in the ſame manner as in the pit. At ſome ſmall diſtance from the corners, let there be racks ſet up for food, which ſhall be within the reach of the bucks; and one or two others in the middle.

When the houſe is prepared, let the bucks be chained in their places, and the does turned in. They will all live much more comfortably than in the pits; and at the times of taking away their young, let them be put into the ſmaller rooms or cloſets, prepared for that purpoſe, where they will live and thrive very comfortably. Such a building will coſt little, and the profit from the rabbits will be greater than any other way; becauſe they will breed freely throughout the winter; and neither the old nor the young, will be ſubject to diſeaſes. They will alſo be defended better againſt vermin than by any other way whatſoever.

The feeding of the rabbit is an article of conſequence, with regard to its health and increaſe: ſome feed them almoſt entirely with wet meat, others almoſt altogether with dry; both are wrong. A mixture of food, keeps them better in health, and occaſions their breeding faſter.

The dry meat of the rabbit is hay, oats, and bran. Their moiſt food is freſh herbage, or roots, which they will eat with the greateſt eagerneſs, as coleworts, parſley, &c. from the gardens; and ſow-thiſtles, mallows, and the like, from the fields. Theſe I would adviſe the huſbandman to give them interchangeably; always obſerving, that when he gives them dry meat, he muſt ſet them water; and when they have the freſh meat, they have no occaſion for any.

It is a cuſtom with many to cut up the freſh food for their rabbits from under an hedge, taking every kind of herb ſo it be young. The rabbit will eat almoſt any; but ſome caution is neceſſary, hemlock is common under hedges, and is poiſonous; the rabbit will eat it greedily, but it dies by the effect.

The hay that is given to rabbits muſt be the fineſt, ſweeteſt, and ſhorteſt that can be got. Nor let any one grudge the expence, for they eat little.

This is the beſt and healthieſt food for rabbits, and ſhould be their ſtandard diet; but about once in five days they ſhould have freſh herbs, which cool and ſcour them. By this management they will be kept healthful and vigorous; always ready for breeding, and their young will be luſty, ſtrong and thriving.

Among the other food of the rabbit ſhould be mentioned grains: this is of a middle nature between the moiſt and dry; and is a very cheap diet; but it is not wholeſome, and therefore is dearer in the end. The rabbits will ſeem to thrive upon it, but no food makes them ſo liable to diſeaſes.

The advantage of their dry meat is, that it prevents diſorders: and thoſe who commonly keep them upon freſh and moiſt food, giving them carrots and other eatable roots among it, would do well to change it for dry in wet weather:

ther: moiſt food is the great cauſe of theſe creatures having the rot, and they are moſt of all ſubject to this in damp ſeaſons.

BOOK V. PART II.

Of Fowls.

CHAP. XXVIII.

Of the cock and hen, their kinds and choice.

THESE are animals of ſmaller ſize, and leſs advantage than the capital articles of the farmer's ſtock, yet not to be neglected. The hen, when conſidered with reſpect to her eggs and chickens, not to mention her body, and the feathers, affords an article, though ſmall in compariſon of ſome among the preceding, yet worthy of the farmer's careful regard.

Though the profits are ſmall, in proportion to thoſe of the ox or ſheep, they come eaſier. There is leſs trouble and expence in theſe creatures, even than in the rabbits. They in a manner take care of themſelves; feeding the ſcatterings of the barn, with little aſſiſtance; and maintaining themſelves even where there is not this, by their own care, with very little help.

Fowls are a ſtock the pooreſt may keep, and ſuch as the richeſt ſhould not neglect; they are univerſal, and they very well deſerve to be ſo: they are a comfort to the peaſant, while they add their profit alſo to the general purſe of the wealthy farmer.

The huſbandman is to provide himſelf with cocks and hens as a needful part of his ſtock, and he need not be afraid of overdoing in this article; theſe are not like thoſe creatures, numbers of which require great attendance, and rich paſturage: a very conſiderable quantity of them will provide for themſelves in his yard, and at the barn door, for the greateſt part of the year, without doing him any damage, and will be ſupported during the remainder, at a very ſmall expence.

The advantages they afford are in a manner continual: they are a conſtant ſupply for the family, and market; where, according to their management, they afford a larger or ſmaller price.

The value of every thing riſes in proportion to the demand; and on this will depend the particular directions for the farmer in this article. The great demand for fowls is in large towns, therefore he ought to proportion the quantity to his ſituation. If he live in a lone place, it will not be worth his while to keep more than will ſerve for his own family, and for a few of his neighbours who may purchaſe of him: but if he be ſituated near a market town, eſpecially if within a due diſtance of London, he may ſtock himſelf as largely as he pleaſes: the greater number the more the profit. There is there a conſtant market throughout the year, for one kind or other.

Additionally to this, he has their feathers and dung.

A great deal depends upon the firſt choice of fowls, for the whole brood to come is to be of the ſame kind with the parents.

The induſtry of thoſe who breed poultry, has of late years greatly multiplied the breeds: but theſe differences are not ſo great as many imagine. They ariſe from ſmall diſtinctions, and will ſometimes go off in the continuance. Between the Darking fowl, and the little Bantam, there are many degrees in bigneſs: and the game breed is altogether diſtinct from both.

Among the ſeveral breeds, let the farmer conſider which will beſt anſwer the demand he is like to have for the produce: only in ſome meaſure, indeed, he is to be guided in this by the circumſtances of his farm. He who has a good barn door, and a rich yard, may keep a proper quantity of the largeſt breed in health and vigour: the common or ſmaller kind will ſucceed beſt with the peaſant or the poorer farmer, for they will ſupport themſelves by running about the roads and hedges, eating inſects, ſeeds, and whatſoever can afford a living creature nouriſhment.

Upon theſe two conſiderations the food and the demand, the huſbandman will be able to know which breed it will be his intereſt to take.

Which ſoever kind it be, let him obſerve theſe marks of goodneſs.

Let the cock be large for his kind, well ſhaped, and lively: the cock is naturally an upright, ſtately, and majeſtick bird; when he appears without theſe characters, 'tis a proof ſomething is amiſs. The cock that does not ſtrut, is not fit for the father of a brood. He ſhould be long in the body, and thick in the garth. His neck ſhould be long and naturally arch'd, free in its motions, and well covered with feathers. His comb and watles ſhould be large, and of a bright red; his eyes full and ſprightly, and their colour anſwerable to that of his feathers. His beak ſhould be ſtrong and hooked, his legs ſturdy; his ſpurs long and ſharp, and his claws ſhort and ſtrong. As to colour, the two beſt are the red and the white: the red is fitteſt for a ſtout breed, and the white for a more delicate.

In the choice of the hen, the ſame general marks are to be obſerved, only her aſpect ſhould be mild as the cocks is ſturdy. She ſhould be lively and well coloured; her claws ſhort and ſtrong; and if ſhe want the hinder claws, it is ſo much the better.

When the fowls are thus choſen, let them be obſerved as ſoon as they are put into the ground, for if any thing be amiſs in them, that is the time to change; and it is much better to ſell the bad again, and buy others, than to ſit down content with ſuch as are not of the beſt kinds: the loſs attending this can be little, and is but once; the diſadvantage of having a bad kind is continual.

The cock ſhould be buſy and noiſy: he ſhould be often crowing; and from time to time ſcratching up the ground to turn up worms and other food for the hens. The hens ſhould be briſk, but quiet; a crowing hen is as bad as a dumb cock: theſe neither lay any quantity of eggs, nor ſit well.

If any of theſe faults appear in the fowls that are bought for breeders of a ſtock, let ſuch as have them be changed; till ſuch as are in every reſpect right, are obtained.

The proportions of the two ſexes ſhould be about one to ten: a ſingle cock will ſerve twelve or fourteen hens; but the moſt profitable way is to allow a cock to every ten of them; and this way they will breed to the fulleſt advantage.

CHAP. XXIX.

Of the breeding of poultry.

THE yard being ſtocked with poultry in proper number, of the fitteſt kinds, and with the choiceſt of the breed, the next care is the managing them to the beſt advantage for breeding.

The age is a conſiderable article; and their employment muſt be ſuited to that: it would be ill huſbandry to ſtop the profitable laying of a hen, by ſetting her upon her firſt eggs, when there are ſuch as are fit for nothing elſe, and will do this better.

The youngeſt hens are the beſt layers, and thoſe advanced into years are the beſt ſitters. In both of theſe reſpects the farmer is to have regard to the feeding: any extream is wrong, whether in exceſs, or in defect. If they be ſtarved, they will want ſtrength; and if they be fed too high they will grow fat. A fat hen is always lazy, and will never lay well, nor ſit quietly. The feeding them moderately is the only right method.

The beſt ſeaſon for ſitting, is ſpring or ſummer; the earlier in ſummer the better, and the firſt months in ſpring are beſt of all. March is the beſt month for chickens to be hatched. The hen ſits only twenty days, ſo the huſbandman will know when to put her upon the eggs for the beſt brood: that is in the laſt week in February; and from that time he may continue breeding till the firſt in October.

He ſhould never ſet a hen that is leſs than two years and a half old; from this time to five, or between five and ſix years is the beſt for producing chickens. The fineſt broods will be obtained when a hen of a good breed, and of about three years old, is ſet in the middle or end of February, upon a parcel of well choſen eggs laid by a young hen of a good kind, who has let no cock come near her but her own.

That in order to the having a due quantity of eggs, the hen that lays muſt be fed moderately. But there is ſomething to be ſaid for the kind of food, as well as the quantity.

The pretences of increaſing the laying of hens by particular diet, have been ſlighted; but they have been ſince confirmed upon repeated trials; and no argument can ſtand againſt experience. The two beſt food are buckwheat and hempſeed. The effect of theſe is equal in reſpect of laying; but the one fattens at the ſame time and the other does not, therefore the condition of the hen is to fix which is preferable.

If ſhe be inclined to fat, Buckwheat muſt not be given, it will encreaſe her fat ſo as to take her off: in this caſe hempſeed is the proper kind. On the other hand, when a hen is poor, the proper kind is buckwheat.

The beſt number of eggs to be put under a hen for ſetting, is ſeventeen. They muſt be freſh and ſound, and let the upper ſide of every one of them be marked blue; when the hen gets from her neſt for feeding, ſee if ſhe have turned them all, or any of them. Such as ſhe has not turned, the owner muſt turn for her. From this he will know how to value her for ſetting afterwards; for the hen that turns all her eggs herſelf, is greatly preferable to thoſe negligent ones which omit it.

To judge of the ſoundneſs of her eggs hold them up to the light, and ſee that they be full and clear.

When a hen is ſet, ſhe muſt never be diſturbed againſt her will; and care muſt be taken to ſet her food and water. If ſhe be put from her neſt, ſhe often forſakes it; and if ſhe be obliged to go to ſeek for food and drink, oftentimes ſhe is obliged to be abſent ſo long, that the eggs chill, and the chickens are killed in them.

This care is needful during the whole time of her ſetting, but moſt of all toward the end. The chickens are then formed, and they require the conſtant warmth of her body to keep them alive, a ſmall time of chilling will utterly deſtroy them.

When the hen riſes from her eggs, to feed upon what is ſet before her, ſome perſon ſhould ſtir up the ſtraw of her neſt and lay the eggs regularly together, that ſhe may find all agreeable at her return.

The cock is to be watched upon theſe occaſions, for when the hen is off her neſt, he will offer his ſervice to ſet for her, but he does this very awkwardly, he frequently breaks ſome of the eggs; and the hen is always diſpleaſed at it.

In the choice of eggs for ſetting, if there be any larger than uſual, they are to be rejected, for they will not lie even, and will cool thoſe that are next them. Theſe often have a double yolk, and they are the eggs which produce misſhapen chickens.

As nothing more is requir'd for the hatching of chickens than a due heat, there has been long a cuſtom in Ægypt, of hatching them without the help of hens, in ovens, by means of a ſmall and regular fire. They produce in this manner vaſt broods at a time. This cuſtom has of late been brought into Europe; in France Monſieur de Reaumur made many experiments, and at length with ſome ſucceſs. From the publick account he gave of this, the ſame has been attempted in England, and among other ingenious perſons, the honourable Mr. Stanhope tryed it, and ſucceeded: but there does not ſeem any probability of its being brought into common uſe: indeed ſo much nicety is required, and ſuch a great deal of care of the chickens after they are hatched, that it appears rather fit for an amuſement for the curious, than an employment for the huſbandman.

If a hen dies, or a brood become by any accident motherleſs,

therleſs, mix them among the chickens of another hen that are about the ſame age, and ſhe will take care of all together. A hen may thus be brought to conduct three or four broods: and this is the moſt favourable circumſtance concerning the hatching of eggs by art; but there is a limitation in the number; and at preſent the attempt is not to be recommended to any on the foundation of utility or profit.

Although we have fixed the ſetting of the hen to the ſummer and ſpring months, it is not to be underſtood that they will not ſet at other times. Eggs may be put under them at any ſeaſon of the year, and they will hatch them; and for thoſe that chuſe to beſtow a ſufficient attendance, the winter broods may be worth raiſing, for they bear the beſt price when they are grown up for ſale in ſpring. This, however, requires more trouble than the huſbandman can well beſtow upon ſo ſmall an article; and it is therefore we have recommended the ſetting of the hens in the end of February to any other time.

When the breed of chickens is the only care, the white fowls with white legs and white beaks are to be prefer'd, becauſe of the colour and tenderneſs of their fleſh, but theſe are not the beſt layers.

If eggs be the principal care, the red cock and mottled hen are to be prefer'd.

If a hen that has been fed with buck-wheat, to make her lay frequently, grow too fat upon that diet, ſhe muſt be fed with oats: for at the ſame time that they take down her fat, they aſſiſt her breeding of eggs.

It is not intended that the fowl ſhould be kept upon theſe things entirely. She ſhould be left to take ſome care of herſelf abroad, for her ſtirring about will do her ſervice; only what addition to her natural food is requir'd to keep her in health and ſtrength for laying, ſhould be of theſe kinds.

CHAP. XXX.

Of the bringing up of chickens.

WE have led the huſbandman, or rather the good houſewife, (for this care naturally falls upon her) from the purchaſe of this ſtock, to the hatching of the young brood. Theſe are the moſt eſſential as well as the moſt valuable articles under this head, and we ſhall therefore lay down ſuch rules for the breeding them up, as experience has ſhewn are the moſt uſeful.

Twenty days is the ſmalleſt time the hen ſets: ſome eggs are longer than others according to the thickneſs of the ſhell, their place under the hen, or other accidents, and they ſometimes are one and twenty, and ſometimes two and twenty days.

In this, patience is the remedy. There have been ſeveral ways propoſed of aſſiſting the hen in hatching, but they are fooliſh and unneceſſary. All ſhould be left to nature.

In large broods, it often happens that ſome chickens are hatched a conſiderable time before the others, often one, and ſometimes two days. In this caſe let the hen be watch'd to ſee how ſhe treats them, for if ſhe be careful, nothing better can be done than to leave them with her. But if ſhe be reſtleſs, and ſeem troubled with them, it will be beſt to take them away.

Let a little wool be put into the bottom of a ſieve, and let them be ſet in the reach of the warmth of the fire; and thus nurſed up till the hen has hatched the reſt, and can take them under her care. Nothing is needful but to keep them warm: the chicken in the two firſt days requires no food.

For the firſt feeding of the chickens, the beſt thing is a mixture of white bread crumbs and ſmall oatmeal. Let a quantity of theſe be mixed up, and then put a part of it to ſteep in milk, and keep the reſt dry. Give the chickens a little of each ſort at times, as they follow the hen.

After they have got a little ſtrength, they are to be fed with bread ſteeped in milk, and then with barley-meal and cheeſe-parings cut ſmall, and the like, and the hen will by this time greatly aſſiſt in the providing for them, tho' at the firſt ſhe can do little more for them, than the keeping them together, and nouriſhing them by her warmth.

In cool weather it is beſt to keep young chickens within doors, till they have got ſome ſtrength. At the worſt ſeaſon, during the months we have recommended, they need not be kept within doors above ten days; in the better, leſs keeping them within will be neceſſary; often ſcarce any at all.

Chickens, while they are young, muſt have good water: they fall into half the diſeaſes to which they are ſubject, from the being obliged to drink foul.

By the food we have directed, and giving them bread, ſcalded with milk, and barley meal afterwards, they may be fattened while under the hen. This is a very common practice in Ireland, and according to the common error of expreſſion in that country, they call theſe ſucking chickens.

The moſt uſeful time of fattening them is, a more advanced growth. When the hen forſakes them, which ſhe does as ſoon as they are able to provide for themſelves, they ſhould be taken up and put into coops, in a darkiſh place, and there fed fourteen days. Their quietneſs aſſiſts, and they will be moſt quiet where they have leaſt light.

They are to be fed by craming, and the beſt food is wheat flour, made into a paſte with milk. This is to be ſoaked in milk and then broke into ſmall pieces, which are to be put down their throats, wetting them well in milk, that they may go down eaſily.

Some prefer barley meal; and others ſpeak greatly of the meal of buck-wheat: but buck-wheat does not anſwer well alone. A little of it mixed with the wheat flour, may do very well; but too much is not profitable.

One thing ought to recommend this greatly, the advantage of their dung. The price they bring will very well pay the expence of feeding them, and he has this addition to the profit. We have mentioned the dung of poultry, and here it is naturally collected together, and he may uſe it before it has loſt any part of its virtue.

CHAP. XXXI.

Of capons.

THE capon, is the cock gelt, and fed properly. The time for gelding is either as ſoon as the hen has left him, or if the teſticles be not come down, as ſoon as he is heard to crow.

The gelding is called carving: there is nothing particular or difficult in it. The teſticles are to be cut out, and the wound heals of itſelf.

The hen being ſpay'd fattens in the ſame manner, and becomes a very fine fowl.

The capon will grow to a fine ſize and delicate fleſh in the yard, and at the barn door: but if ſome meat be given him beſide, he will come into good caſe the ſooner, and thus be very well fitted for the table. To make him bring the largeſt price, he is to be cram'd in the manner of chickens.

To cram capons, let them be kept in a ſmall, quiet, dark place, and fed in the way of the chickens; their dung is to be ſaved, being of great value.

The beſt food is barley meal, with milk mix'd into a kind of paſte, of a moderate ſtiffneſs. This is to be ſhap'd into long pellets, largeſt at the middle, and ſmaller at the ends; theſe are to be wetted in warm new milk, and he is to be fed with them three times a day: for eighteen or twenty days.

Regard ſhould be had to the dung, for knowing the capon's health. The finer the meal is ſifted the ſooner it paſſes through him: ſo that by giving it finer or coarſer, he may be kept in a proper condition during the time of his craming.

If the huſbandman live where there is not a demand for capons, it will not be worth his while to cram any; but ſtill he ought to breed ſome among his ſtock, becauſe they will come into a very good condition for his own uſe, by feeding in the yard; and they may alſo be put to a very conſiderable ſervice, in the breeding up broods of chickens. The capon is to be tricked into this at firſt; but when he has once well taken to it, he will be pleaſed with it.

The large bulk, and ſoft fleſh of this fowl is a great advantage, for he is able to cover a larger number of chickens than an hen, and he will keep them warmer.

The thing that tempts the capon to take this charge upon him, is the pleaſure of feeling their ſoft bodies.

The good women ſting the breaſt and belly of the capon with nettles, pulling away a part of the feathers for that purpoſe: they do this toward his rooſting time, and then in the dark put the young brood under him, the warmth of their bodies allays the itching, and when he ſees them in the morning he takes to them, and will lead them as a hen.

This is not limited to chickens; the capon will lead young turkeys, peahens, pheaſants, ducks, or patridges, and will be better to them than their natural mother, fighting any of their enemies, and ſheltering them on every occaſion. If he grows negligent of them, the method is to ſting him again, and he will take to them as naturally as at firſt. Some ſcratch the capon with briars, or prick him with furzes, to this purpoſe, but theſe are cruel ways, and do not anſwer the purpoſe ſo well.

Before we cloſe this head of fowls, it may be proper to give the good houſewife one caution about the collecting of her eggs, eſpecially when ſhe has a large ſtock of poultry. They ſhould be taken out of the neſt every day, and the proper time is the afternoon, when the hen has left them. The neſt egg is to be left, but never any more. In the place of a neſt egg, ſome cut a lump of chalk into the form, and it anſwers the purpoſe.

Many hens make a cackling as ſoon as they have laid, and ſhew the time to go for eggs, but they do not all do this: and the beſt way is to have one time of the day to go for them.

The keeping eggs a long time, has employed the thoughts of many, and ſeveral methods have been propoſed, many of them idle enough, but ſome uſeful. They have been laid in ſtraw and in bran: but the firſt keeps them too cold, and the latter too hot. Putting them in malt has been found preferable to either. But the beſt way is by dipping them in fat.

An egg ſpoils by the waſting of its moiſture through the ſhell, and this is prevented by any thing that will ſtop up the pores. No method anſwers this end ſo well as covering them with ſome fatty ſubſtance; and the beſt way of doing it is by melting a quantity of fat over the fire, and dipping the eggs in it. They will bring away ſo much as will cover the ſhell ſufficiently.

We owe this to the French, and it has been diſcovered by their philoſophers: in that country the greateſt men are not aſhamed to meddle with the meaneſt ſubjects that can be of publick utility.

CHAP. XXXII.

Of turkeys, their kinds and choice.

THE turkey is a large fine bird, and well worth the regard of the huſbandman. There are diſadvantages in the raiſing of this, as other kinds of fowl; but the benefit far outweighs them.

A great many of theſe diſadvantages, may be prevented by prudent management: and that there is no kind of poultry which will afford ſo many opportunities of improvement. There are breeds of the turkey, much more different than thoſe among the cock and hen; and the proper choice, will greatly add to the profit of keeping them.

The advantages of the turkey are his ſize, the price at market, and his dung, which is as valuable as any other kind whatſoever. His feathers alſo are not to be neglected, in counting up theſe benefits.

Among the diſadvantages are to be reckon'd their ſtraggling diſpoſition, their being liable to many accidents, the difficulty of raiſing them, and the frequent deſtruction by vermin; as alſo the quantity of corn they devour. If they were fed altogether with this, they would eat more than they could be worth; but feeding them with corn is not neceſſary, for they will in general provide for themſelves.

The turkey ſucceeds beſt in open countries, becauſe theſe are not ſo much infeſted with vermin: this may be a reaſonable caution for the huſbandman not to keep them in improper places; but we have counties enough in England that are proper, the farmer is always to ſuit his ſtock to the nature and circumſtances of his farm.

There are many differences among turkeys, in colour and other accidents; but there are alſo diſtinctions of more conſequence, as they depend upon real differences in the kind. Among the common breed there are two ſorts, diſtinguiſhed by their colours, a grey, and a darker. The white kind breed excellently, but they are tender, and the others require leſs care, but they do not hatch ſo many young.

The turkey kind take very little care of their brood: but theſe leaſt of all. If a common turkey, of the white kind, have a large number, ſhe will not miſs half of them, ſo the reſt keep about her; but among the black, if a ſingle young one follow the hen, ſhe never thinks of the reſt, if they be all loſt; and even this ſhe will drop with very little regard or notice.

If the farmer intend to beſtow a great deal of care upon his turkeys, the white kind are to be prefer'd: but if he cannot allow ſo much time, let him chuſe the black: all that is neceſſary is to ſee they are not deſerted while they follow the dam, for after this they will take care of themſelves.

There are turkeys very different from theſe, the wild turkey of Virginia is very valuable: it is large and dark coloured. There is alſo a ſmaller wild kind, of a dark colour, that is much hardier. Either of theſe may be raiſed by the farmer; or he may mix the breed by coupling one of our common turkey cocks with a hen of one or other of theſe kinds. The Engliſh and Virginian turkey make a very good breed, as has been found long ſince by experience. The young are hardy, and will ſoon take care of themſelves; and they are larger, and every way better than the common breed. Theſe will raiſe their young ones in the fields, and bring them in at an age when they can ſhift for themſelves.

Whatever breed the farmer ſhall prefer, let him chuſe ſuch as are good of the kind; and particularly the cock. He muſt be a tall, ſtout, luſty, and ſpirited bird. The turkey is naturally ſtately, and majeſtical; and the cock that is choſen for the breed ought to be ſo particularly. If he hang down his head and look peaking, he never will be good for any thing as a father for the brood. The hen ſhould be large and vigorous; and ſuch as are tameſt are the beſt for the care of their young.

CHAP. XXXIII.

Of the breeding and raiſing of turkeys.

IN breeding of turkeys the age of the cock and hen muſt be regarded. The cock muſt be young, for the brood is never good unleſs he be in the vigour of his life; the hen may be older, for her care in ſitting and leading them is all that is required of her.

The cock ſhould be about two years old; and the beſt age for the hen is at about four years: ſhe may be employ'd in breeding till ſix; but when ſhe is youngeſt, ſhe is moſt apt to neglect the brood; and when the cock is at all declined from his ſtrength, they are weakly.

Turkeys are not natural to our kingdom, and there is always a wildneſs about them. The female does not lay familiarly about houſes, but rambles to a diſtance, and makes her neſt among thickets: for this reaſon her brood is more liable to accidents. The farmer muſt be watchful about the time of her laying, and get her into the hen-houſe, and compel her to lay there.

If there be convenience of thickets, or a little wood near the houſe, ſome let them take their own way, and lay and ſit there; and in the hardier breeds, with a little care of the young when new hatched, this will do very well; but there is never any harm in the other method, and there is a greater certainty of ſucceſs.

The turkey begins to lay in March, and will ſit in April. The eggs are large, and are excellent as food, particularly they have a reſtorative virtue.

The proper number to let the hen ſit upon is eleven: ſome adviſe thirteen, but there is leſs ſucceſs in that method, for they cannot be all covered.

In directing the quantity of eggs to put under a hen fowl of any kind, we ſpeak in odd numbers, as eleven or thirteen, not naming ten, twelve or fourteen. The reaſon is,

that

that an odd number will lie better, and in a more compact heap, when we come to ſuch quantities, than an even. This is owing to the ſhape of the eggs, and is a fact any one may ſee on trial.

The turkey ſits ſeven or eight and twenty days. Some of the eggs will be hatched at five or ſix and twenty, and ſome will lie till thirty, but the middle time is the moſt natural.

The hatching is the time when the greateſt care is required. The turkey being a bird of a warmer climate, is chill in this; and particularly the tender young. They muſt be kept carefully at firſt, eſpecially ſuch as happen to hatch before others. The beſt way is to put them into a baſket with wool, and ſet them before the fire, at ſuch a diſtance as to be gently warm'd.

From this time ſome body muſt act as a parent for them, for the hen is not to be expected to do much: they will follow her, and ſhould be permitted to do ſo in the warm part of the day: the cock will watch over them, keep them together, and defend them better than the hen, but neither are to be truſted without careful looking after.

The proper method is this. They are to be kept in a warm and cloſe place altogether while they are very young; and when they have got ſome ſtrength, they are to be let out two hours after the ſun is up, and taken in again before it ſets.

At firſt they are to be fed in the houſe, and afterwards in ſome open but ſecure place: and at all times they muſt be allow'd ſufficient food, for their parents take little care to help them to any. The beſt food is green freſh cheeſe, and while they are young, their drink ſhould be new milk; afterwards milk and water, making it weaker till they come to water alone, which they will then drink wherever they can find it. Curds are a good food, but not ſo well as cheeſe. A wholeſome food alſo is a thick haſty pudding made of oatmeal, water, and a little new milk.

As the tenderneſs of the young is one great diſadvantage in the turkey, care muſt be taken that the hen do not ſet herſelf too ſoon. If the young are hatched in cold weather, it is ſcarce poſſible to rear them: but if they be produced toward the latter end of May they will have a better chance.

It is only while young this bird is ſo exceedingly tender; for, when grown up, it will bear the coldeſt of our weather very well. Grown turkies ſtand our ſevereſt winter nights expoſed, better than common fowl. They are frequently ſubject to be loſt while young, by ſtraggling from the dam, and one another, but it is only while young they are liable to this; for, when grown up, they are ſtrong enough to defend themſelves; and they always love to keep together.

The huſbandman who has many turkeys, muſt take a care to keep them out of his garden: no bird does ſo much miſchief there. But their profit is very well worth the trouble they occaſion in this and other articles.

When young turkeys have been raiſed to ſome ſtrength and bigneſs, they may be left to themſelves. They had reaſon to complain of the expence of theſe fowls, who fed them conſtantly with corn; for they are great devourers: but we find by experience, there is no occaſion to feed them, with that or any thing elſe, till they are to be made ready for ſale. They will at all other times take care of themſelves, and keep in good caſe with what they find under hedges, and in the yard.

They are naturally fatter in winter than ſummer; for they are an indolent bird, but the cold gets them a ſtomach: and this is the beſt time for feeding them for the market.

To do this they muſt be houſed; but it is beſt not to keep them up entirely, for they will in that caſe loſe their appetite, and come on poorly. They muſt be let out the greateſt part of the day, but it is beſt to keep them where they cannot run much about. The food to begin fattening them with is good barley, boiled till it is ſoft: Oats will do; but barley is better. Let them have plenty of this a fortnight, with ſome air and ſunſhine, but a great deal of reſt. After this they are to be cram'd every morning, with a paſte made of barley-meal and new milk; in long pellets, wetted in warm milk to make it go down. They are to be well fed in the morning, and then ſuffer'd to go out, but they are to be kept as quiet as may be. They are not to be cram'd any more that day, but during their being out, corn is to be thrown to them at times: this will keep them feeding, and keep them quiet, and thus they will in a little time fatten up in a very fine manner.

This is their right management from the egg to the preparing them for the market; in which all the diſadvantages ſuppoſed to attend them, may eaſily be obviated and prevented; and that all the care that is needful is, when they are very young, and when they are preparing for the market: at the firſt of theſe times the leaſt cold kills them; and at the other, they will not fatten unleſs carefully tended: all the reſt of their lives they provide for themſelves; and the price they bring, whether ſold as poults, or when grown up and fatted, is ſo conſiderable, that it very well anſwers all the trouble.

CHAP. XXXIV.

Of geeſe; their kinds, and the profits of keeping them.

THE gooſe is different in its nature from the hen and turkey, they living on land only, and this, part of its time in the water; for which it is qualified by the nature and make of its feet contriv'd for ſwimming.

The huſbandman muſt conſider, how he is ſituated with reſpect to water before he determines on this head. Of the ſeveral water fowl that are bred tame, the gooſe is leaſt devoted to that element, as it walks well on land, and finds moſt of its food there. Geeſe will live where there is little water: but though they will live where there is little, they thrive better where there is more.

The huſbandman is to conſider, when he is about to raiſe his ſtock, what kinds ſuit beſt the nature of his ſituation; and from this he is to be led in his choice which to have in the greateſt number. Where he has little water, he ſhould breed ſome geeſe; but where he has much of it, he may fall greatly into that way.

Some may fancy it leſs worth while to be careful about theſe, becauſe their profit is leſs than from the hen or turkey; but the trouble is alſo leſs: and their value is not ſo ſmall as ſome affect to make it. They are ſold at a good price in ſpring when they are young, and in autumn when full grown; and beſide this, there may be a great profit made of their feathers: many millions of geeſe are raiſed in ſome parts of this kingdom for no other uſe.

We ſhall adviſe the farmer, who is conveniently ſituated for the breeding of geeſe, to look upon them as an article of ſome conſequence; and we would have no one who has any quantity of water at all, utterly neglect them.

There are three or four breeds of geeſe, though not ſo much regarded as the differences among other fowls. We have alſo ſome others of curioſity, but they are not worth the huſbandman's conſideration.

The large grey gooſe that is bred in the fen countries is preferable to any other, both for fleſh and feather, and it grows to the biggeſt ſize of any. We have a ſmall grey gooſe, and a ſmall dark colour'd. Neither of theſe are ſo advantageous as the grey; and among the large kind that are ſo call'd, thoſe are much better which are all of a colour, than ſuch as are pyed or mottled.

Some of theſe breeds are more under a neceſſity of water than others. The ſmall bodied dark colour'd gooſe, will do where there is ever ſo little, but they are the leaſt profitable. The large grey gooſe requires to have plenty of water, nor does it any where ſucceed ſo well as where there are running ſtreams: the leſſer grey, which is often pyed, will do with leſs than this, though it will not thrive unleſs there be ſome plenty.

Therefore if he would have many geeſe where there is not much water, he ſhould chuſe the ſmall grey kind; but when he has water enough, let him always breed the firſt mentioned ſort.

Another advantage for the breeding of geeſe, is a good quantity of common: they will on theſe places provide for themſelves, without the trouble of the owner; and it is on the common fen lands in Lincolnſhire, and the adjacent counties, they keep thoſe vaſt droves of them, for the ſake of their feathers. They pull theſe once, or twice a year, and find a ready market for their produce.

Nothing agrees ſo well with the gooſe as plenty of room, on a damp common. They will breed of themſelves once a year, and in ſome places twice, bringing up the broods with leſs trouble or loſs than any other fowl.

The natural time of rhe gooſe's breeding is ſpring, and the earlier it is the better for the owner. The farmer who keeps them about his houſe, ſhould beſtow ſome attention upon this head.

Some geeſe will not lay above nine or ten eggs, others ſeventeen: they rarely exceed that number; and if they do, the beſt method is to take ſome away before they ſit. A gooſe will cover fifteen, ſeventeen is the utmoſt ſhe can. There commonly is better huſbandry in ſetting her on fifteen: for when there are too many, they only cool one another.

That gooſe is beſt which lays earlieſt; for the green geeſe will be ready in the deareſt ſeaſon; and ſhe has the beſt chance for a ſecond brood that year.

There is an opinion, that if the gander treads the gooſe on land, the eggs do not anſwer ſo well as when the copulation is on the water. From this they attribute the frequent failing of early eggs, to the waters being frozen over when the gooſe was trod; but this is idle: the misfortune is owing only to the coldneſs of the ſeaſon.

CHAP. XXXV.

Of the breeding and feeding of geeſe.

WHEN the gooſe is about laying, ſhe carries ſtraw about continually for making her neſt: and the owner will do well to aſſiſt her. Let him find out a convenient place warm and quiet, and there make her a neſt of ſtraw and nettle roots: ſhe likes the ſmell, and it does good to the young.

When he obſerves ſhe continues upon the neſt a conſiderable time after ſhe has laid, it is a proof that ſhe is about to ſit.

The gooſe muſt ſit upon her own eggs: ſhe will not do it well if ſhe perceives any deceit, though they be of the ſame kind.

Geeſe ſucceed well enough that lay where none know of it, yet they will be greatly aſſiſted, and the brood from the ſame number of eggs, will be larger, if the ſame care be taken of them that is allowed to other poultry.

The careful houſewife when her gooſe riſes from the neſt, will ſet a quantity of proper food before her, that ſhe may find it without trouble; and ſome large veſſel of water that ſhe may waſh herſelf. The beſt food is bran ſcalded, or oats; when ſhe ſets near a pond or river, ſhe ſhould not be hindered from bathing herſelf, for ſhe will not ſit kindly if ſhe be not allowed to follow nature; and this bathing of herſelf at large is much better than the waſhing in any veſſel that can be ſet for her.

While ſhe is off her neſt, it is fit to turn the eggs, if ſhe have not done it herſelf: and when ſome hatch before the others, they ſhould be kept in wool, in a warm place, till the others are hatched.

The time of ſetting is from ſix and twenty to thirty days according to the ſeaſon.

Let the goſlings be kept within doors ten days; and fed with barley-meal in milk, or ground malt, or curds, or bran ſcalded with milk. After this they ſhould be ſuffered to go out in the middle of the day; and at about a fortnight old, the gooſe may be ſuffered to entice them to the water.

They are to be tended and fed occaſionally, till they have ſtrength enough to defend themſeves againſt vermin, and to provide for themſelves. For ſeveral days after their firſt going out, they ſhould be brought in at night, and ſomebody ſhould watch them, for they are poor defenceleſs creatures, and a prey to every thing; but when they are ſo far grown as to feed well, and walk ſtoutly, they may be left to ſhift for themſelves. With leſs care than this broods of geeſe will often ſucceed very tolerably; but this enſures their ſafety.

There are two periods at which the gooſe is fatten'd for market: firſt, when it is very young. It is diſtinguiſhed at theſe times by different names, the green gooſe, and the ſtubble gooſe.

The right age for taking up the goſling to fatten it for a green gooſe, is at five weeks. The beſt food is ground malt, or oats, boil'd in good plenty three times a day with milk, and milk and water for drink. If they be ſhut up in a quiet dark place they will thrive the faſter; and may be brought into condition in a fortnight.

For fattening the ſtubble gooſe, the ſame method and the ſame food are to be uſed, and in a fortnight or three weeks, it will be ready for the market. Taking them up ſoon after the harveſt ſeaſon, is a favourable time; becauſe in running in the ſtubble fields, they will have got into tolerable fleſh; and then being kept quiet, and dark, and well fed with the nouriſhing drink of milk and water, they ſoon fatten to perfection. It is a good cuſtom to put a little barley-meal into their milk and water, and to let this ſtand conſtantly before them: it will encreaſe the power of the food in getting them into the due fleſh.

The natural food of the gooſe is principally graſs. They live very well in commons and waſte places, where there grows little or nothing elſe, during the greateſt part of their time. The ſtubble fields are a great advantage to ſuch as are to be fattened: for the food they pick up there from the ſcatterings of the harveſt is richer, and tends more to the nature of that of which they are to be fed when put up for that purpoſe. The proper gooſe for feeding up in this manner is one hatched the foregoing ſpring, that has run among the ſtubble about three weeks: this takes to feed kindly, and grows fat ſoon.

The proportion in this kind is properly one male to five females. To a flock of forty geeſe, which is a very good number, there are to be eight ganders: more will be ſuperfluous, and with a ſmaller number they will not breed to the full advantage.

If while a gooſe is in fattening it nauſeates its food, and does not thrive, let there be ſet before it a diſh of ſmall and clean gravel. This will recover its appetite.

CHAP. XXXVI.

Of ducks.

THE duck is deſigned partly for land, and partly for the water, but it is more of the water kind than the gooſe. It not only has feet form'd for ſwimming, but the legs are ſo placed that it walks badly; and is naturally more in the water than on land.

The huſbandman will perceive that whether he ſhall keep ducks, or in what number, muſt be determined from the circumſtances of his farm.

As the duck will be content with puddles, he may keep ſome wherever there is the leaſt water; but where there is plenty, and roving room, the ducks thrive, eſpecially where it is a running water.

If he is ſituated near a river, he is beſt qualified to breed ducks to advantage; and they have enough value to make it worth his while to breed them. He is not to count the price of any thing alone, in order to underſtand his profits; but its price compared with the expence and trouble: and he will find the duck of a very fair value: for as much as its price is leſs than that of the others, ſo much leſs is the expence needful about it; it is indeed ſo hardy, that it may be left to itſelf; and its young ſo early take to the water, that they are out of the way of moſt enemies.

The only time which requires care, is while the female is ſitting, being then kept from going in ſearch of her food, ſhe will need to have ſome ſet before her: but the coarſeſt and moſt ordinary will do; at other ſeaſons ſhe will live very well upon the ſcatter'd corn about the yard, the offal of the houſe, and what the current of a running water is continually bringing down. Scarce any thing comes amiſs to her; yet her fleſh is delicate: ſhe is leſs miſchievous than any other fowl; ſhe lays abundance of eggs which are as good as thoſe of the hen, and ſhe hatches very numerous broods, which are fit for the market at two ages, when young, and when grown up: and in either caſe are eaſily fattened.

There are ſeveral kinds of ducks kept in England; but the huſbandman needs not give himſelf any trouble about more than two of them, the common tame duck, and the wild duck kept tame.

Of the tame ducks are ſeveral breeds, worth the farmer's notice, becauſe of their different ways of living. The wild breed require more water, and the tame will do better than they to be kept in the yard. Among the tame, there is a narrow beak'd breed, which is hardier than the common, and will do with yet leſs water; and there is a breed that have the beak more turning up at the end: theſe are the better layers. They do not bring up their numerous broods ſo well as ſome of the others, but when eggs are the principal conſideration, theſe are to be prefer'd.

The common tame duck does beſt in gardens and orchards, none is ſo cunning in picking up worms, ſnails, or other inſects, or devours them in ſuch quantity.

It is a great number of eggs that may be had in the ſeaſon from the kind juſt mention'd; and ſhe will in the end ſit; though the others better. It is more profitable to ſet a hen upon the duck eggs, than any kind of duck whatever, becauſe the old one leads the young too ſoon to the water; they follow the hen a good while upon the land, and get hardy before they venture.

Thirteen eggs is the beſt number to let a duck ſit upon. The hen will cover as many of theſe as of her own.

When the ducklings are hatch'd, they require no care if the weather be good; but if it be a very rainy ſeaſon, it is beſt to take them under cover a little, eſpecially in the nights.

The fattening of ducks is very eaſy, and whether it be the duckling, or the grown duck, the method is the ſame. They are to be put into a quiet dark place, and kept in a pen where they are to have plenty of corn and water; any corn will do, and they will fatten themſelves extreamly well in fifteen or twenty days.

CHAP. XXXVII.

Of the keeping of wild water fowl; and of decoys.

THERE are ſeveral other water fowl, which people of curioſity keep in ſome places; and for which there is ſo good a price at market when they are by any chance brought thither, that it may be worth the huſbandman's while, where his ſituation is proper, to follow the method that has been taken by thoſe who had no farther view, than to ſatisfy their fancy in keeping them.

Theſe are to be kept in a manner wild; though under the care of the farmer. They muſt have a place of ſecurity; and opportunities of hiding; they muſt not be diſturbed by peoples often going near them; and they muſt be fed as it were by ſtealth.

The great intent is to make themſelves fancy they are wild though in confinement. Teal, widgeons, and many other kinds, may thus, where the farmer has the proper conveniences, be raiſed in a kind of wild ſtate, and in conſiderable plenty.

The firſt requiſite is, a ſpring of water, upon ſome level ground, that wets a moderate extent, and lies to ſome depth in different places: or elſe a part of the arm of ſome river, or rivulet, that the farmer has wholly at his diſpoſal.

Let him fence the ſpot well round; plant oziers in ſome parts, and encourage the growth of ſedge, and all ſorts of weeds in others. This will give the fowl many hiding places: the top is to be cover'd with a net. When all is thus prepar'd the wild fowl are to be put in; and being kept very quiet they will breed and live comfortably. And thus conſiderable broods will be raiſed.

Theſe will provide for themſelves in a great meaſure. The food that is to be given them may be corn of the cheapeſt kind: it ſhould be thrown down in two or three different places at night, when they are at rooſt, that they may find it in the morning. This will accuſtom them to come to certain places, and will give the owner better opportunities of knowing his ſtock, and of taking them when convenient.

When there are young among them there ſhould be ſcalded corn thrown in, which the old ones will lead the brood to eat: no creature is more careful of the young, than theſe water fowl, nor are any birds whatever ſo ſoon able to ſhift for themſelves.

This is the method of breeding theſe water fowl in ſmall numbers, and ſomewhat of kin to this is practiſed in the fen countries, of taking them in decoys: which yields the owner a prodigious advantage.

The decoy is a watery place, well planted, of large extent, and properly diſpoſed for the taking of ſuch wild fowl as come into it. Nature generally has made the place, and all that the owner has to do is to keep every thing quiet about it, it. This has no covering at top, nor fencing at the ſides: its extent is ſufficient to keep the thickeſt parts from annoyance, and all is to be open for the fowls coming in. There are nets planted in proper parts, and a number of decoy-ducks, as they are called, are continually well fed in it. Theſe, though of the wild breed, are in a manner tame; they know the people and are not afraid of them; for they find they are well fed, and ſuffer no hurt.

Theſe go out at times, and ſettling among whole flocks of wild ducks, lead them to the decoy, and ſwim before them into the nets: they know they ſhall not be hurt. The people take the wild ducks for market; and turn theſe looſe for farther ſervice.

CHAP. XXXVIII.

Of the ſwan.

THE ſwan is leſs profitable than the meaneſt of the others, and therefore, notwithſtanding the majeſty of its figure, is leſs worth the farmer's regard than any. It is kept rather for oſtentation than uſe, and more properly belongs to the owners of waters than the renters of land. However, as it is a common bird kept tame, it might appear an omiſſion not to have given ſome account of it.

The ſwan has been deſigned by nature for the water: it walks very awkwardly on land: but on its proper element it has great ſtrength, inſomuch that when the hen ſits, the male who guards the neſt, is often very furious; and at any time will defend himſelf againſt a middling dog; and often drown him.

Swans require a large compaſs of water, and do beſt upon rivers: for they are kept without charge. Neither are they ſo hurtful as thoſe imagine who have been told they deſtroy fiſh: their natural food is graſs and the freſh water weeds, that run at ſome little depth under the ſtream.

They require no more care than feeding, but being once put on the water will, in all reſpects, take care of themſelves.

Thoſe who are very tender of their ſwans will give them a little attendance while they ſit, but this is not altogether neceſſary.

They chuſe the place for their neſt themſelves, and this is ſo large that it is eaſily ſeen; if the owner would aſſiſt them, he is to do it by planting boughs about the place, if not naturally ſhaded, and when ſhe ſits, he is to place ſome oats in a trough near the neſt, that ſhe may not be induced to leave the eggs too long in ſearch of food.

The ſwan lays from ſix to twelve eggs: her common brood is four or five. If the eggs hatch nearly together the brood is the more numerous; if not, when there are four or five young ones hatch'd, ſhe ſets off with them, and takes no notice of the remainder. To prevent this the young ones may be taken from her as they are hatch'd; and ſhe will then continue ſitting to the laſt. Theſe firſt hatched young may be preſerved in wool, till committed to her care with the others.

The time of the ſwan's ſetting is from ſix to ſeven weeks, and often there will be ſome of the young hatch'd three days before the others. Theſe when taken from the parents ſhould have ſcalded oats and milk ſet before them the ſecond day.

The young follow the dam in the water, and ſometimes get upon her back; and ſhe is ſo excellent a guardian that ſhe very rarely loſes any of the number.

Thoſe who are fond of uncommon ſorts of food, fatten young ſwans for the table.

If the young cygnet be taken at once out of the water and dreſs'd, there is not ſo ill-taſted a fowl; for its food being river weeds, gives the fleſh a rank taſte; but when they are fatted for eating, they not only get a great deal more and tenderer fleſh, but it is of a better flavour. They are much like the green gooſe, only larger, and coarſer, and their taſte ſtronger.

To fatten them they are to be taken from the parent at five weeks old, and put in pens in a quiet darkened place: they are to be fed to their full appetite with oats, and to have milk and water for drink. In a month, they will be fit for the table.

CHAP. XXXIX.

Of the peacock.

THE peacock is kept like the ſwan, for beauty more than uſe; ſome make it turn to account for the table, but 'tis not a common marketable proviſion; and nothing is worth the farmer's regard, that he cannot regularly take to ſale.

'Tis hardly worth his while to let it take up the room of ſome fowl that might anſwer his purpoſe: for the ſake however of thoſe who ſhall chuſe to raiſe them for their beauty, we ſhall lay down ſome ſhort obſervations on their nature and qualities.

The peacock is the ſtatelieſt and moſt beautiful of the feather'd kind. It is very tender while young, but afterwards hardy enough; and as it requires little care, and finds itſelf in food, it may ſometimes be worth while where there may be a demand for the chick, to allow one peacock and peahen to run among the poultry.

The peacock is kept without expence, and he is uſeful to the owner in his feeding. He rids the ground of vermin, for his feed is efts, toads and ſnakes. He will eat corn when he can get it, but the other is his common diet.

The peahen will make her neſt in thickets and buſhes; and ſhe takes great care to hide it from the cock, for he will deſtroy the eggs.

When the peahen has ſet herſelf, it will be proper to put ſome corn and water near her, that ſhe may not be under a neceſſity of leaving her eggs to chill, while ſhe is ſeeking at a diſtance for food.

The time of her ſetting is thirty days, and as the chicks are tender when firſt hatch'd, they muſt be houſed for ſome time, the cold otherwiſe ſoon killing them. During this time they are to be fed with freſh cheeſe, or barley-meal and water. They muſt be let out in the middle of the day, and taken in at night, and when they have got ſome ſtrength and bigneſs, they may be truſted out with the dam, and no farther care need be taken of them. The cock ſeems not to own them till the feathers that form the coronet upon their head begins to riſe; but after this he is as fond of them as the hen, and will call them about him to feed, providing for and defending them with great care.

From the time of their going at large, they need no more care of feeding or attendance, except any one has a mind to fatten them for the table. For this the uſual time is when they have arrived at about half their growth: they are then put in a dark quiet place, and fed with any kind of corn as much as they will eat, and to have plenty of water. This will make them fat in a month, and their fleſh will be better taſted than when they run at large, but they are inferior to almoſt any kind of fowl, and have a very ſtrange, raw, bloody appearance, when they have been ſet by for a night after dreſſing.

CHAP. XL.

Of the pheaſant.

THE pheaſant, though naturally a wild bird of the woods, is much of the common poultry kind, and may be eaſily bred in the proper places. This is an article in the way of the gentleman rather than the farmer, therefore we ſhall not detain our induſtrious reader with any long diſcourſe on the ſubject.

There are pheaſantries in many parts of England, but there requires a great deal of care about the birds when young; and they are in danger from kites, hawks, and other birds of prey at all times. The pheaſant is the favourite with theſe devourers.

The rooſting places are to be well defended; and the fence is to be high to prevent their eſcape. They lay freely, and bring out large broods, and with good diligence, a number may be rear'd.

The food of the young pheaſant is that white ſubſtance called the ants eggs. The old ones when wild lead them to ant hills in the woods for this, and they muſt be ſupplied with it by the induſtry of the keeper, when bred tame: this occaſions a great deal of trouble at firſt, but after that they will be train'd up with great eaſe, for they will eat any kind of corn, and are not tender.

CHAP. XLI.

Of pigeons.

WE come to a fowl ſmaller than any of the before mention'd kinds, but ſuperior to many of them in value. The management of this is different from that of the others, but there is no one of thoſe about which ſo much care is generally taken, that is more worthy of the notice of the huſbandman.

It will be kept at ſmall expence: the proper pigeon for the dovecoat, which is the only kind he is to regard, the greateſt part of the year provides for itſelf; and when it requires aſſiſtance, the food is not of a dear kind. Beſide the breed, there is that great article their dung, which is of ſuch great ſervice as manure, that it muſt be the intereſt of every farmer to provide it for his own uſe.

There are many kinds of pigeons kept in England, by people fond of curioſity, and it has become a ſtudy to procure and raiſe new varieties among thoſe who are called pigeon-fanciers, but with this the induſtrious huſbandman has nothing to do. He is to keep pigeons for their value, not their beauty; and he is to conſider which may be managed with moſt eaſe, which is in his way one of the greateſt of recommendations.

There are two principal ſorts; the tame, and dovecoat pigeon. The tame is valued for his beauty, and for the largeneſs of its body; the common pigeon, kept in dovecoats, is ſmaller, and leſs beautiful.

The tame have but two young ones at a brood; but they make amends for the ſmallneſs of the number by the frequency of their hatching: if well fed and tended, they will have young ones every month.

In the choice of theſe the beauty is moſt regarded; but there ſhould be care taken to pair them well, and this is the more worth while becauſe they are not apt to ſeparate afterwards.

They muſt be kept clean, and their food is ſo dear, that few but thoſe who know very well how to manage them care to meddle with them. The beſt is tares or white peaſe, and they ſhould have beſide this ſome gravel ſcatter'd about; with clean water at all times; and a great deal of care muſt be taken to preſerve them from vermin, and their eggs from the ſtarlings and other birds, which always haunt the places where they are kept, to ſuck them.

To the perfect thriving of theſe pigeons, it will be proper, beſide their food, gravel, and water, always to let there be ſome ſalt, clay, or ſome mixture with ſea ſalt in it, for them to peck at their pleaſure.

We have ſaid thus much of the tame pigeon, for ſuch as chuſe to breed them; and although the expence and trouble they occaſion be more than is worth the huſbandman's while in general to give himſelf; yet their dung is richer than that of the common pigeon.

The common or dovecoat pigeon, is a ſubject that deſerves the huſbandman's utmoſt regard.

The keeping of pigeons is a great advantage obtained at a very ſmall expence: they thrive beſt in open countries.

The huſbandmen in ſome places ſow great quantities of horſe beans and grey peaſe, and in theſe pigeons feed to a great advantage. Theſe ſorts of pulſe are ſow'd earlier than other kinds: their early feeding upon them makes them healthful, and is an occaſion of their breeding earlier than they do elſewhere.

The common blue pigeon is properly the dovecoat breed; and it has the advantage of other kinds in that it is hardier, and will live in the worſt winters.

If it be too ſmall we may mend the breed by putting in a few tame pigeons of the moſt common kinds, and the leaſt conſpicuous in their colour: this is to be done with caution, for though the bigneſs of a pigeon's body is a plain advantage, yet the ſmalleſt are the beſt breeders.

The ringdove has been by ſome introduc'd into the dovecoat, by ſetting the eggs under a common pigeon; they will live, and take their chance among the pigeons: and they have two advantages, the one in their largeneſs, and the other in their hardineſs.

The huſbandman ſhould have a careful eye upon the proportion of the ſexes among his pigeons. There is nothing ſo hurtful as the having too many cocks. Moſt people who keep them make their conſciences eaſy about deluding away thoſe belonging to their neighbours; but an abundance of cocks thins the dovecoat, for they grow quarrelſome, and will beat others away.

A very cheap way of making a dovecoat is to build the walls with clay mix'd with ſtraw: they may be made four foot or more in thickneſs, and while they are wet it is eaſy to cut the holes in them with a chiſſel.

This beſide its cheapneſs, has the advantage of great warmth, and no building agrees better with pigeons. Such a dovecoat four yards ſquare in the clear, may be built for five pounds.

The holes ſhould be fourteen inches deep, and a little dipping backward. The reverend Mr. Lawrence who uſed this method, ſays, the pigeons proſper'd in it better than in any brick or ſtone building he had ſeen.

Of whatever materials it be erected, it ſhould be whitewaſh'd frequently on the outſide. The pigeon is a cleanly bird: and the white colour renders the building more conſpicuous.

As to food, beſide the peaſe and tares, barley is very proper; and buckwheat alſo is an excellent as well as cheap food.

For the greateſt part of the year they take care of themſelves. There are only two ſeaſons at which it is neceſſary or proper to feed them. The depth of winter, and the middle or latter end of June.

The reaſon of feeding them in the firſt of theſe ſeaſons is obvious; the latter, is called benting time. There is a graſs called bent graſs, the ſeed of which is ripe about this ſeaſon, and is the only food of that kind the pigeons can eaſily get. This is poor food, and pigeons at this ſeaſon uſually have many young broods; ſo that they will be ſtarv'd if they are left to it. The farmer will always find his account in giving them food at this ſeaſon, as well as at the other.

The breeder of tame pigeons gives them a lump of ſalted clay, and the ſame indulgence muſt be ſhewn to theſe. But as they are more numerous, there is to be a larger allowance. A large heap of clay ſhould be laid near the dovecoat, and the brine of the family continually beaten among it. Another way is to make a kind of mortar with lime, ſand, clay and ſalt, which they will peck with great ſatisfaction: 'tis beſt to make it thin, and keep it ſo by often beating it up with brine.

In ſome places they lay what is called a ſalt cat, near the dovecoat. This is a large lump of ſalt made at the ſalt pans; and is the common method where there are works in the neighbourhood, but ſalt in a mixture with clay is better.

What I have found anſwer beſt is this. A heap of loam is to be laid near the dovecoat, and beat up to a kind of pap with brine: into this is to be thrown a large quantity of bay ſalt, and a little ſaltpeter, with a ſhovel full or two of large coarſe ſand. If the loam contain a great deal of ſand, the leſs is to be added to it; where loam is not to be had clay will do, but a much larger quantity of ſand muſt be put in. The beſt is large coarſe ſea ſand, or that which is got in ſcreening of gravel.

Salt is not only uſeful to pleaſe the pigeons, when in health, but nothing recovers them ſo readily from ſickneſs. A mixture of bay ſalt and cummin ſeed is an univerſal remedy.

Many contrivances have been publiſhed for making the pigeons love their habitation. Some have adviſed the uſe of aſſafœtida, and other of cummin ſeed, but the beſt method is to keep up conſtantly a heap of ſalted loam: this they love, and they will ſtay where they can have it in plenty. This with the addition of keeping the dovecoat neat and clean, and not ſuffering them to be diſturbed, will keep the ſtock in good number, and perhaps increaſe it at the expence of their neighbours.

The profit of pigeons is very certain; for they breed faſt, and there is a conſtant demand. Near great towns it may be worth while to keep ſome of the tame kind; becauſe their young come early, and are ſo fat and fine, that they command a large price. But in the country the common pigeon is the proper kind; for though the price is not ſo great, their number, and ſmall expence of keeping, make amends.

Among the methods recommended for drawing pigeons to a deſerted dovecoat, one of the moſt ridiculous is that of a baked bitch. The creature is killed at the time ſhe is proud, and then flead, baked, and laid in the dovecoat. Some improve upon the practice, by putting cummin ſeed in the belly: for the pigeon is really fond of the odd ſmell of this ſeed. This may have ſome effect; the other can have none. The plain account of this is, that a dovecoat has been deſerted becauſe of its dirt and naſtyneſs; and they have cleaned it out, and laid the baked bitch in it. The effect of the cleaning they have laid to the carcaſs of the animal.

I have ſpoke often to farmers to recommend ſetting up of dovecoats; but have found it difficult to make them liſten to me. While they have bought pigeons dung at a large price, and fetch'd it from a great diſtance, they have ſtill been backward to think of keeping pigeons for their ſupply. There is a ſuperſtition among them, that it is unlucky to ſet up a new dovecoat:—this has come from father to ſon, and they perſuade themſelves it would certainly be follow'd by death in the family. Nothing can be ſo ridiculous, or ſo weak, but there never was an old woman's tale ſo deeply rooted.

BOOK V. PART III.

Of Fish.

CHAP. XLII.

Of the advantages of fiſh ponds.

FISH are not conſidered ſo much as they ought, by the huſbandman, as a part of his ſtock: but we ſhall endeavour to ſhew that it is as eaſy for him to manage theſe as any other of the already mentioned creatures, and that the profits are very well worth his attention.

He muſt have ſome water, and he may, according to the ſituation of his farm, have a great deal. Fiſh will live in this, and he may have a reaſonable profit in all caſes, and in many a very large one.

One kind of fiſh will live in one water, another in another. There are ſome ſpecies that will live in all. He who has water, and leaves it unoccupied, defrauds himſelf of a part of his natural advantages.

It is not only his intereſt to put a ſtock of fiſh into ponds, when he has them; but it may be often worth his while to make ponds for this purpoſe.

We would put the farmer in a way of making the moſt from his land; and conſider in what inſtances art may come in to the aſſiſtance of nature.

We ſhall here ſhew how he may ſtock the water, and how render that proper for fiſh, which was before unfit. And in what caſe it may be to his advantage to dig ponds for them.

There may be parts of his ground, which yield little any way elſe, and which may be converted to this uſe. He ſhould put them to that uſe, though at ſome expence; and we ſhall lay down the moſt advantageous method of doing it. Theſe lands are of two kinds; thoſe which are naturally watery; and thoſe which lie in the bottoms between riſing grounds. The firſt kind are to be choſe, becauſe they are fit for little elſe, and the ſecond, becauſe they will anſwer the watering of cattle, as well as the breeding of fiſh. They will be ſupplied by the waters from the riſing grounds, and will bring a great profit, as well as great convenience.

We write here to the gentleman as well as to the farmer; and we may name the ſupply of the table as a great article. All that is ſaved in the expence is got: and the addition of good fiſh in plenty is a conſideration of great value. The farmer is to conſider the demand at market; but this is abundantly enough to anſwer his purpoſe.

When the ground is fixed upon for making a fiſh pond, let the undertaker conſider, whether there be ſprings to feed it, or it muſt depend on the rains: this makes a different management neceſſary. Ponds that have ſprings will be ſafe from drying on an entire flat: but there ſhould be a deſcent to thoſe which are to ſupport themſelves by rains.

When flags and ruſhes grow on a low piece of ground, 'tis a proof there is water near. The natural products of ſuch lands are of little value: let the huſbandman conſider the expence and profit, this way or by culture, together with his own occaſions for water, and the extent of the ground; and then determine what courſe to take.

In thoſe grounds which lie between hills, ponds will have the advantage of what is waſhed from riſing grounds by rains. They will feed fiſh, water cattle; and afford from their bottoms a rich manure.

The water that runs in wet ſeaſons from hills does not go off pure rain: it waſhes with it the lighteſt and richeſt parts of the ſoil, and the fineſt part of the manures the huſbandman has laid on his grounds. This enriches the water, and feeds fiſh in a ſuprizing manner; and after all it is not loſt. The making ponds in theſe places is the true way of ſaving it. All runs into them with the water: it ſettles to their bottom after a time; and is finally left there. This is the occaſion that ponds ſituated ſo as to receive the water from high lands fill up ſoon, but that is no diſadvantage; on the contrary, it is a laſting ſource of manure. Theſe ponds are eaſily cleaned, and the mud many times over pays the expence of the work. It is proper proviſion ſhould be made for receiving the fiſh during the cleaning of the pond.

The neceſſity of cleaning ponds is abſolute, but ſo is the advantage. The time is different according to their ſituation. Thoſe in an even ground, that are fed by ſprings, need not be ſcoured above once in fifteen years; but ſuch as receive theſe rich waters from hills, require it every four or five years.

We have reminded the farmer of the great value of thoſe creatures which are kept at little expence; this in the firſt expence is all. Many creatures are to be kept at a little charge; fiſh entail no expence upon their owner at all, for they will provide for themſelves entirely.

It may be ſometimes proper to throw into a pond where fiſh are feeding, ſome things of very little price, but even this is not neceſſary. Thoſe of prey are to be ſupplied by firſt ſtocking the ponds with roach, and the like; which are of ſo little worth, that they are fit for nothing elſe, and are ſo numerous that they may be drawn up in a net by buſhels: for the reſt, grains, or refuſe of the like kind, is all that can be given them.

CHAP. XLIII.

Of the making of fiſh ponds.

HE who would make conſiderable advantage from fiſh ponds, muſt have ſeveral: ſome to receive the fiſh, while others are cleaning; and ſome for one kind, and others for another. If he put his fiſh of prey and his others together, he would find a very ſorry account.

Different ponds alſo are intended for different uſes. Some are for breeding, and others for feeding of the fiſh. There ſhould be a diſtinct pond for the pearch, and another for the carp and tench; and there ſhould be one pond for carp to breed, and another for them to feed in. In thoſe ponds where carp breed, they feed poorly; and in thoſe ponds where they feed well, they ſcarce breed at all.

Fiſh ponds are of two kinds, ſuch as have ſharp and clear water, and ſuch as have it ſoft and thick. The firſt are for breeding, the others for feeding.

From what has been ſaid of the number and variety of ponds, the farmer will the better conceive what is meant in thoſe directions we are about to give for the digging of them.

The beſt method where the ground favours, is to have a row of ponds, with a ſmall feeding ſpring at the upper end for the ſupply of the whole; ſo that in dry ſeaſons they may be kept up with a due quantity of water. There ſhould be alſo contrivances for letting off the uſeleſs or abundant water from them, that they may not be overflow'd.

At the end of every pond ſhould be a ſluice: this head muſt be made in the lower part of the ground. It muſt be firm and ſound, and the ſluice ſhould be ſo made, that the water may be let off freely and quickly: the great care is, that there be a ſufficient fall.

For making the head of the pond, a quantity of ſtrong ſtakes are to be provided. They ſhould be ſix foot long, ſtrait, thick, and of timber that will bear dampneſs.

Let him ſet about his work by driving the ſtakes firmly into the ground in three rows, at four foot diſtance row from row, and about three foot ſeverally in each row. Theſe rows muſt be carried the whole length of the pond head: and the firſt row muſt be driven four foot into the ground.

This is a ſufficient preparation for the ſuperſtructure, where the ground is tolerably firm; but in places where it is looſe and ſandy, it is a good method as ſoon as the ſtakes are rammed, to pour in a large quantity of lime. This will ſlake gradually with the wet, and mixing with the ſand, will become of itſelf a firm mortar, binding all about the ſtakes in the manner of a ſtone.

When the ſoil is not abſolutely ſandy, and yet is not firm, it is a good way at firſt to put a layer of earth, and a layer of lime, and ſo work up the foundation.

When the ſtakes are driven, and the ground is ſecured, let the workmen begin to dig the pond.

Let the earth be thrown among the ſtakes, and rammed well down, and thus laid in till they are entirely covered.

Another parcel of ſtakes are then to be driven in the ſame manner as the firſt, and in the interſtices between them, the earth that is dug is to be again laid; and ſo, if needful, a third parcel are to be driven, and filled up in the ſame manner with the earth that is dug out. The nature of the ſituation is to determine this, and the expence will be proportion'd to the making of this head in height.

This head is not to be raiſed perpendicular, and all of a thickneſs; but ſloping upwards on each ſide. It muſt be thickeſt at the bottom, and ſmaller all the way up: and the ſlant on the inſide muſt be made ſmooth and even.

The reſt of the work is cheap and eaſy. The whole ſtring of ponds are to be made in this manner, and they will be managed afterwards with eaſe and convenience. It will be a great addition to the work if a ſide ditch be dug, with ſluices out of each pond to it, for the emptying them ſeparately. By this contrivance any one of the ponds may be emptied without diſturbing the others.

The ſize of the ponds, that muſt be proportioned to the nature of the ground or the quantity of fiſh.

The depth is a material article: for there are great inconveniences attending the making it too deep or too ſhallow. One reaſon of the ill ſucceſs of fiſh ponds in ſome places is, that the owners have taken them juſt as they found them. A clay pit, or a gravel pit, may be converted into a fiſh pond; but he would be very idle who ſhould take either for that purpoſe juſt as he finds it.

The proper depth is ſix foot. It may be ſomething deeper, but no pond ſhould be of a leſs depth than this, at middling fullneſs.

The ponds are to be ſome for breeding, and others for feeding of the fiſh; the pooreſt water being for breeding, and that which is moſt enriched by additions, for feeding.

Suppoſing theſe ponds to be all ſupplied by one original ſpring riſing above the firſt; running through that, and thence into the others; the water ſpring will be clearer, ſharper, and purer in the firſt pond, than in thoſe others into which it runs through that, and ſucceſſively through one or more of them alſo. In ſuch a ſtring of ponds, the firſt will be fitteſt for breeding, and the laſt fitteſt of all for feeding; and ſo of the reſt proportionally, thoſe will be fitteſt for breeding which are neareſt the firſt, and thoſe for feeding which are neareſt the loweſt. There muſt be a difference in the conſtruction of the ponds, according to theſe purpoſes.

One breeding pond is enough to ſupply ſeveral for feeding: ſo that the proper method will be to keep the firſt for breeding, and the ſeveral others that come next after it, for the pike, perch, and other fiſh of prey; and only the two or three laſt for feeding: theſe will receive their water enriched by what it has collected in paſſing through the others.

The firſt pond ſhould be the ſhalloweſt of all: and ſhould have ſome places particularly ſhallow, and contrived for the receiving the ſpawn. Its general depth may be five foot, juſt at the head it may be, for a little way, five and a half, or ſix foot: the head itſelf ſhould be carried down with a gentle deſcent into that depth, and toward the water's edge bottom'd with a clean gravel. The ſides ſhould alſo, in moſt places, go down with a gradual deſcent, and here and there be extended in ſhoals; ſome of which ſhould have ſtones and gravel thrown over the bottom, and the others left naturally. Theſe ſerve for the fiſh to ſun themſelves; and they lay the ſpawn upon them, which there receives the influence of the ſun, and is aſſiſted by it in the hatching into life.

Ponds that have a clean water, and a gravelly or ſandy bottom, are beſt for breeding; thoſe which have a ſoft or muddy bottom for feeding.

The middle ponds, ſhould be of a ſomewhat greater depth than the others, that the pike, which grow large, may have a ſufficient ſcope of water: but it will be convenient in theſe to let the head deſcend gradually, and to have ſhallows purpoſely left in ſome places, as in the breeding ponds. Theſe fiſh will not only breed there themſelves, but their food the roach, and other ſuch ſhould be encouraged to breed alſo. This they will do on theſe ſhallows purpoſely left, and in this manner ſuch a ſupply will be raiſed, that the pike and perch will find their food naturally provided.

Thoſe ponds intended for feeding carp, and ſuch other fiſh, which are to be at the lower part of the row, ſhould have the common depth of ſix foot, in a manner throughout; but it will be proper to leave here and there a little iſland ſtanding in theſe; and in other places to hollow away the banks underneath, and to plant willows, and other watery trees, that their roots may bulge out into the water. All theſe will ſerve to give ſhelter and hiding places to the fiſh. Theſe contrivances are proper alſo for the middle ponds in which fiſh of prey are kept: in the breeding ponds they are leaſt needed. Though in moderation, ſhade and ſhelter are convenient every where. It is a good practice to ſink ſome ſmall faggots in different parts of the pond, when new dug: they will ſerve the purpoſe of ſheltering, till weeds riſe.

If too many trees be planted on the banks, they do a great deal of harm by the falling of their leaves; and too many, or too large iſlands left in the ponds, take up too much room; moderation is the rule.

CHAP. XLIV.

Of the ſtocking of fiſh ponds.

THE huſbandman who makes ponds for profit, muſt form them according to the ſeveral purpoſes they are to anſwer. We will ſuppoſe he has eight of them in this ſpring, and has contrived the firſt for breeding of carp and tench, the ſecond for breeding pearch, the two laſt for feeding his carp and tench, and the four middle ones for feeding his pike and pearch.

The four kinds of fiſh already named are the principal that he is to regard. Trout will not thrive in ſtanding waters.

Eels are worth keeping in ponds, but there need not be any kept on purpoſe for them. They are a fiſh of prey like the pike and pearch, and they may be kept in the ſame pond with either, they will thrive upon the ſmall fry that are kept for the ſupport of the others. They will grow to a great ſize in theſe ponds, but they are not like the eel of the river for taſte. The fineſt eels are thoſe caught in clear and ſhallow trout rivers.

Some put their pike and pearch into the ſame ponds, imagining that the pearch will eſcape the jaws of the pike. Where there is plenty of other food pike will let the pearch eſcape, but when hunger calls he is not nice in diſtinctions.

Some keep chubs, bream, flounders, and the like in ponds, but they anſwer no uſeful purpoſe. The price they will bring at market is nothing in compariſon of the others. A bream is not good for any thing till very large, and it will not grow to this under fifteen or twenty years, and requires deep water. When it is at its perfection few know that it is good; and 'tis not the pleaſant but the faſhionable diſh, that brings money. If gudgeons be kept it muſt be in the firſt pond, but they come to little there; they naturally live in ſwift ſhallow rivers: in ponds they loſe their colour and their flavour.

Theſe conſiderations fix the huſbandman to the five kinds already named.

The firſt pond is to be ſet apart for the breeding of carp and tench, which may breed together as well as live together afterwards; for they will neither hurt one another when grown, nor devour each other's ſpawn.

Carp is the moſt profitable fiſh, and we ſhall begin with conſidering them, and deliver what relates to them moſt particularly. No fiſh bears a better price: and none ſpawns ſo frequently. When we add to this, that the carp is of quick growth, we have compriſed all that can be ſaid in praiſe of a fiſh to him who keeps it for his advantage.

Carp will breed at ſhorter intervals than any other fiſh, and the young are vaſtly numerous; they require little care, and are ſufficiently hardy. The great caution is to provide and keep up a ſufficient number of breeders.

The female carp never breeds till about eight years old. The male need not be more than five years. The purchaſer muſt examine their ſize and condition, before he puts them into his breeding pond, that he may not be diſappointed. Many have condemned the nature of their pond, when the fault has been in the condition of the fiſh.

The males ſhould be about one to three females; and not only a proper number muſt be put in at firſt, but a watchful eye kept that they do not decreaſe without ſupplies, for the carp often dies after ſpawning.

The tench agrees in all theſe reſpects with the carp; and being put into the pond with the ſame regulations, the two kinds will breed together.

Into the ſecond pond are to be put the pearch for the ſame purpoſe, and with the ſame cautions. They will breed when they are kept in the other ponds, but they are ſo ravenous they eat their own offspring. And the only good way is to put them into thoſe ponds nearly of the ſame ſize.

Pike will ſometimes breed in the ponds where they are kept for feeding, but more in large rivers. Pearch will alſo breed in their ponds, but few of the young come to any thing, for both kinds feed upon their own. The putting fiſh nearly of a ſize into the feeding ponds, is as neceſſary with reſpect of the pike as the pearch, for they will both devour ſuch of their own ſpecies as are ſmaller. A pearch of half a pound weight will ſeize one of a quarter of a pound; and the pike will lay hold of ſuch as are very nearly as large as himſelf; he will prey upon any thing that he can get into his mouth.

Theſe are reaſons why fiſh of prey that are put into ponds to feed, ſhould be nearly of a ſize: and there is ſome cauſe, for obſerving the ſame rule with the others, for though they will not eat the ſmaller, they will ſtarve them.

The beſt way of matching the ſize of the fiſh is by ſupplying the feeding ponds from the breeding: for thoſe that are of the ſame breed, muſt be equal in bigneſs, and being put into the ſame place, and having the ſame food, they will keep up that equality. Pike are generally purchaſed, and the care ſhould be to buy them nearly of a ſize, otherwiſe the number will decreaſe continually. When pearch are bought, the ſame caution is to be obſerved. As to eels, they need not be ſo carefully pick'd, for they are defended from the other devourers by their place of habitation; and though they ſeize upon any other fiſh they can get at, they do not prey on one another.

The farmers muſt not ſuffer his geeſe or ducks, with their young brood, to come upon his pike ponds; for that voracious fiſh will ſeize the young, while they are in the down, as readily as he would a roach or a gudgeon.

When the ponds are ſtock'd, the owner ſhould take care that herons do not get a habit of coming there, and he muſt be particularly guarded againſt otters, if there be any in the neighbourhood. Theſe are the enemies of his feeding ponds; and there is one little regarded, but very deſtructive in thoſe for breeding, this is the ſtittleback. As contemptible an enemy as this may ſeem, none is ſo deſtructive of the ſpawn and the young brood, and none ſo difficult to be conquer'd. I have known many ponds that would have been excellent for breeding, ſpoiled by this little creature. The emptying them is hardly a ſecurity; for theſe ſmall fiſh will live in the leaſt quantity of water that remains in any accidental hollow, and they breed ſo quick, and in ſuch numbers, that they ſoon are in a condition to renew their miſchief. They lodge under the ſtones where the carp ſpawn. They devour the ſpawn wherever they find it, and what eſcapes and hatches into life, becomes their prey in that condition,

tion, for they are eternally catching the young fiſhes.

There has been ſuppoſed a great myſtery in breeding ponds; ſome will and ſome will not do for that purpoſe, and it is ſaid there is no knowing but from tryal. We have named the wrong age of the fiſh, for one reaſon of failing; another is this deſtructive creature; and a third may be the ill conſtructing of the pond. Let theſe three articles be managed rightly, and the undertaker will ſeldom fail.

The numbers kept in the feeding ponds, muſt be proportioned to their extent, and to their richneſs. A good feeding pond, of an acre, will every year ſupport two hundred carps, of three years old. If they be put in younger the number is to be encreaſed in proportion, the ſame pond will as well feed three hundred carp of two years old, or four hundred of one year old. If the pond be leſs rich, the number muſt be ſmaller, and if of the richeſt kind of all, it may be ſomewhat encreaſed.

Tench may be put in after the ſame manner: it is a good method to put in one third part of the number tench.

The nature of the pond as to its ſuiting one or the other kind, depends on the ſoil. The carp loves a loamy bottom, and the tench a muddy one. The carp loves a new pond, and the tench an old one. The carp is found to thrive beſt where there are a great many weeds, and good ſhelter, and where there grows long graſs abut the edges of the water: the tench loves a deep pond, with a warm owzy ſoil and hollow banks; and delights in the cluſters of flaggs that often run into the water to a good diſtance from the ſhore.

From this the owner will conduct himſelf according to the particular nature and condition of his ponds. If they be nearly alike, let him put tench and carp together into each, and proportion them according to the nature of the pond, adding to or diminiſhing the number of the tench, as it appears to be more or leſs ſuited to them. If one of the ponds be well ſuited to carp, and the other to tench, let him put all his carp into the one, and all his tench into the other.

Tho' tench and carp be freſh water fiſh, they will thrive where it is a little brackiſh. This is of great conſequence to farmers ſituated toward the ſea. They often have grounds of no great uſe where fiſh ponds may be dug and ſupplied, but that the water will not be perfectly freſh: they need not for this reaſon be diſheartened from breeding carp and tench: they will ſucceed as well there as in the moſt perfect freſh ponds. Where the water is too ſalt, they do not taſte ſo well as in the freſh water feeding; but where it is only a little brackiſh, they thrive better; and the difference is not perceived.

CHAP. XLV.

Of feeding, preſerving, and taking fiſh out of ponds.

THE fiſh being put into the ponds are to be provided with food, preſerved from injuries, and at proper ſeaſons taken out for the market.

As to feeding, that requires little care or charge. The pike and pearch are to be furniſhed with a quantity of roach, dace, gudgeons, and the like, the common draught of every little river; but he muſt have his eye upon them, that if they do not breed, he muſt at times throw in a freſh ſupply. As to the carp and tench ponds, they in a great meaſure ſupply the fiſh themſelves by the richneſs of their water, and by the inſects and ſmall animals that breed in them: but if at times he throws in grains, blood, and the offal of chickens, their guts and the like, the fiſh will feed the faſter. The ſame may be thrown into the breeding ponds; the grains into the carp and tench ponds, and the offal into the pearch.

This is all that is required on the article of feeding. Care muſt be taken to keep off thieves, eſpecially near great towns, where there is a ready market: the keeping a good watch, and the ſinking things in the ponds in a proper manner to prevent the drawing of them, are the great ſecurity.

There is another accident to be named by which numbers of fiſh are often deſtroyed, that is the froſt.

When water is altogether covered with ice, the fiſh languiſh, and if this continue a long time many die. Many break the ice, and this always has a good effect. The damage done by froſt is much greater in foul ponds than in clean. For this reaſon the ponds ſhould be frequently cleaned, which is an article of advantage to the farmer rather than expence, becauſe of the value of their mud. When they are kept clean, the froſt will have leſs effect upon the fiſh; and to prevent the damage entirely, there ſhould be a few pipes laid into the water in different places, with their ends above its ſurface. Let the froſt be ever ſo ſevere, theſe will always keep a communication with the air.

Some lay in ſtraw, but its effect is not ſo certain: that of a few pipes is obvious, and cannot fail.

The frequent cleaning of ponds, is alſo ſerviceable to the fiſh.

For the taking the fiſh out of the ponds, there require a few inſtructions.

In the common way with nets, a great deal of miſchief is done by ſervants, hurting thoſe which are to be thrown in again, by blows; and keeping them too long out of the water: and in the other way of draining, a great diſturbance is made by letting the water of one pond into another. Againſt this we have propoſed a method, by a ditch cut along the ſide of the ponds, which every one who deals largely in fiſh will find vaſtly worth his while to practiſe.

Once in three years every pond ſhould be drained, and the fiſh taken out and ſorted, removing the larger and ſmaller than ordinary, to keep up that equality, which we have ſhewn to be ſo eſſential an article in the management of every kind.

The breeding ponds are to be drained as well as the others; and from them are to be taken the young fiſh of proper ſize for the ſupply of the feeding ponds, in anſwer to the quantity that have been taken out. And when this is done, the remainder are not to be thrown into the breeding pond again, for they will ſtarve the breeders: they muſt be put ſomewhere to take their chance, if they be not wanted on any particular occaſion.

Great care muſt be taken not to hurt the breeders, either by violence, or by keeping them too long out of the water; and if the due numbers be found deficient, they muſt be ſupplied with thoſe of a proper age and condition.

Thus the whole ſtring of ponds will be kept in order, and yield great advantage: there will be a conſtant ſupply from the one to the other; and the fiſh will anſwer as regularly the farmer's expectations, as any part of his ſtock.

When any fiſh are taken out for ſale, the maſter's eye ſhould be over the draught: it will keep in his mind the condition of the ſtock, and he will ſee that no hurt is done to ſuch as are to be put in again.

If the farmer have convenience of digging a pond where it will have a marley bottom, he may be ſure of feeding carp to very great advantage. If he have opportunity of making a pond where it ſhall receive the waſhings of ſinks, or the foulneſs of great houſes, or about large towns, he may be ſure in the ſame manner both carp and tench will fatten in a ſurprizing manner. If he can make a pond at the head of a chalky ſpring, he may feed trout in it, and this is the only pond that can at all ſuit that fiſh: but even here they will not ſucceed as in rivers. If the pond be dug in a bed of clay, or if he clay it to make it hold water, and it be found too cold for the better fiſh, he may breed flounders in it. They will take care of themſelves, and will grow to a great ſize; they thrive in ſuch ponds better than in rivers, but their taſte is not ſo fine.

When ponds are made in boggy places, where carts cannot well come to get away the mud, the beſt method is to dig them long and narrow, like ditches, that the workmen may be able to throw out the mud on either ſide at a ſingle toſs.

The pike grows faſt, and is well worth keeping in feeding ponds: thoſe of ſix inches long may be had for a ſmall price near large rivers, and if put into ponds with plenty of food, they will grow to fourteen inches the firſt year, and the next to two or three and twenty. To fatten them they ſhould have eels chopped to pieces: they will devour theſe greedily. When pike grows to a good ſize, it bears a large price, but the conſtant and marketable fiſh is the carp. On this the perſon who intends to make advantage of fiſh ponds, ſhould principally rely: none require ſo little trouble, or is liable to ſo few accidents.

None is ſo ſafe from the common accidents as the carp. It will endure froſt better than any; it is ſo ſhy, that it preſerves itſelf from common enemies. No fiſh is more difficult to be taken out by the common methods of ſtealing. They will not readily bite at the hook when grown to a ſize, in rich ponds; and even the caſting net rarely ſurprizes them. They plunge to the bottom upon the firſt notice of any diſturbance in the water, and ſtrike their heads into the mud. The net draws over their tails, without laying hold of them.

BOOK V. PART IV.

Of Bees.

CHAP. XLVI.

Of bees, their nature and products.

THE bee is kept with little expence, and leſs trouble; and it yields him two commodities that are always marketable, wax and honey.

Volumes have been written on this inſect before its nature was well underſtood, and volumes therefore might be added: for with the more perfect knowledge of its nature, we have arrived at the diſcovery of many of its qualities: but we do not here expatiate for the ſake of idle curioſity. It is the intereſt of the huſbandman to keep bees, for they will bring profit, and naturally fall in the way of his profeſſion; this we recommend to him: and that he may do it in the moſt advantageous manner, we ſhall lay down the beſt rules for that purpoſe. As we have endeavoured hitherto to explain every article of his buſineſs, that he might always know what he ought to do, and why he was to do it; we ſhall lay before him here in a few plain words, an account of this creature, ſo far as he needs to know it, with the nature of thoſe products which it offers to his ſervice.

The antients ſuppoſed bees produced from the corrupted fleſh of animals, and pretended to lay down methods of procuring them: but all this is known to be an error. Virgil adviſes killing bull calf, and expoſing its fleſh in a particular manner for the breeding of bees: but there is no more truth in this than in Sir Kenelm Digby's receipt to make crawfiſh.

All creatures are produced from the eggs or embryo's of their parents, and they can be produced in no other manner.

In inſects, all ſuch as have no wings, are produced from the eggs of their parents, in their own forms, but all thoſe which have wings undergo a kind of change. Theſe are hatch'd from the eggs of their winged parents, in form of caterpillars, worms, or maggots. Thus they live a certain time, and then fall into a ſtate of reſt, covering themſelves with a web of their own making; or ſhrinking into their ſkins which harden for that purpoſe: and after they have lain a certain time thus, they break forth in the winged form like their parents.

This has been ſuppoſed more wonderful than it is; the vulgar have thought that it was a change of one creature into another; and the learned adopted the folly, under the hard word metamorphoſis. But the truth is, the butterfly is in the caterpillar, and only takes that time to grow to its due perfection.

The bee being of the winged kind, muſt have its origin in the ſame manner. When the combs are made, a female parent lays an egg in every cell, the eggs hatch into a white maggot; and after theſe have lived their time, they fall into a ſtate of reſt within the cell, and in due ſeaſon the bee burſts forth, and takes its flight.

Bees are of three kinds: in the generality of animals there is a male and female ſex, and no other difference; but among bees, there are males, females, and others of no ſex.

Theſe laſt are the greater number, and go through all the drudgery. The males are but a moderate proportion, and when they have performed their office in impregnating the females, they are driven out of the hives to periſh. The females are very few, but each lays a vaſt number of eggs. They are diſtinguiſhed from the others by their ſize and ſhape, and have been called by the names of kings and queens of the ſwarm.

Wax and honey are extracted from the flowers of plants. The wax is ſomewhat altered by the creature to bring it to that ſtate, but the honey they find in its own form.

In the flowers of plants there ſtand up certain ſlender threads, with little lumps upon their tops. Theſe are in ſome more, in others fewer, and upon the number of them is founded the preſent faſhionable method of botany. Theſe knobs in the centre of flowers, contain a fine duſt, which ſerves to impregnate the ſeeds of the plant: but as nature frequently provides for many purpoſes in the ſame thing, this powder is formed in a greater quantity than it is wanted for the ſervice of the herb, and aſſiſts the bee for its combs, in which to depoſit the honey and its young; furniſhing the materials of which wax is fabricated by the creature.

Toward the bottoms of ſome flowers, and at the bottoms of others, there are alſo certain cells, or lodgments of different kinds, in the which is held a ſweet juice: this is honey. The bee takes it out, and has nothing more to do than to carry it to its cells.

This is the origin of wax and honey. The bee feeds upon on the duſt in theſe lumps in the centre of flowers, and afterwards diſgorges it for the ſervice of the hive. It affords ſome nouriſhment to the little body of the inſect, and after that is carried off, and the reſidue has undergone the operation of the ſtomach, it is wax. With this the combs are formed of that beautiful and uſeful figure, and in the cells of theſe is depoſited the ſweet juice, which they collect from the bottoms of flowers, and which, without any aſſiſtance from them, is honey.

Thus much it is fit the farmer ſhould know; for the reſt it is matter of curioſity, and a great deal might be ſaid very prettily, but very uſeleſly with reſpect to him on the ſeveral ſubjects.

CHAP. XLVII.

Of hives, and the manner of placing them.

THE bee joins its fellows, which collect together into a ſwarm, and make of the wax they prepare from the duſt of flowers, their combs. In which they depoſit the honey.

They naturally place theſe combs in the hollow of a tree, but in order to make the moſt of their products, men have contrived places of reception for their combs, into which they tempt the bees to come. Theſe are hives, which in different places, and at various times, have been contrived of ſeveral forms and materials: but the uſeful kind at preſent are made of twiſted ſtraw, and none are better. A great many ſorts have been deviſed for pleaſure, and the curioſity of ſeeing the bees work; but for uſe none anſwers better than this, nor is any other worth the huſbandman's regard.

There have been contrivances to ſave bees when the honey is taken; but theſe are not neceſſary. A proper management with the common hives, placing one over another for the reception of the creatures, will anſwer all the ſame purpoſes.

Straw hives are often made too high for their width. The beſt ſize is ſuch as would hold ſix gallons, they ſhould be made a little more ſquat than the common practice.

There ſhould be ſome of a ſmaller ſize for receiving the little ſwarms; and a few larger, that they may be in readineſs for an extraordinary large one.

The hives muſt be trimmed ſmooth and even, and the ſpleets are to be then put in, three or four deſcending from the top to near the edge, a couple of others to ſupport the opening or door, and two more behind: theſe laſt are to be thruſt firmly into the ſubſtance of the hive, to keep it from ſinking when full.

The next care is finding a fit place for ſetting them: the bee is tender, and the whole work will proceed the better, for a little care in the ſetting out.

Let the place be choſen not far from the houſe, and defended from winds every way by proper hedges; but theſe ſhould not keep out the ſun; for the bee requires warmth, as well as ſtillneſs. The ſpot muſt be well defended againſt cattle, the beſt ſituation is when the houſe ſtands to the north, and the opening is to the ſouth. There ſhould be alſo ſome trees pretty near to receive the bees at the times of their ſwarming.

Let there be ſet a parcel of ſtools for the hives: the uſual method is to ſet ſeveral together on a bench, but it is not ſo well. It occaſions confuſion among the bees, who miſtake one hive for another, and in winter they will quarrel, and do one another a great deal of miſchief.

The ſtools ſhould be only of wood, for thoſe covered with ſtone are too hot in ſummer, and too cold in winter. They ſhould be raiſed about a foot, or a little more from the ground, and placed a little ſlanting, that the water may run off. On the top they ſhould be about an inch broader than the bottom of the hive; and in front juſt before its door, they ſhould have an extent of the bigneſs of one's hand for the bees to ſettle upon when they come home loaded. Theſe ſtools ſhould be ſet in a row from weſt to eaſt, and they ſhould face the ſouth, a little inclining to the weſt, that the body of the hive may break the eaſt wind from the door.

They may be incloſed in a little boarded building, ſingly, or ſeveral of them together; with a tiled covering to keep off wet, and doors to ſhut or open according to the ſeverity or mildneſs of the ſeaſon.

This is not of abſolute neceſſity, for people keep bees to great advantage without ſuch trouble; but the expence is little; and thoſe things which will of themſelves ſucceed very well, yet often bring larger profits in proportion to the care beſtowed upon them. The two greateſt hurts to bees are cold and wet; and the latter is the greater.

In winter bees are moſt liable to injuries; but theſe they in a great meaſure eſcape if their hives be well made, and well defended. A building about the hives darkens as well as ſhelters them; and this in winter is of great ſervice, for it prevents their going out at every time when the ſun happens to ſhine: this they otherwiſe are too apt to do, and are often killed by the cold while abroad.

For this reaſon the greateſt number of bees periſh in the mildeſt winters. They keep within the hives in very ſevere ſeaſons, and are ſafe, whereas they go out in mild days and periſh.

When bees are kept duſky and ſheltered during winter, the doors are to be thrown open early in ſpring, to promote their induſtry and their breeding.

At the time of ſwarming, the hives are to be rub'd with thyme, hyſſop, or bean tops, and it is a good method to rub a little honey on the inſide.

The hives are to be plaiſtered down to the ſtools with cow dung, ſand, and a little lime, this muſt be carried round the edges to keep all cloſe, and fence out the wind; and in the winter the door of the hive ſhould be ſtopped with a ſmall piece of board that has two or three notches in it to let the bees through, and not large enough to let in any thing that would hurt them.

CHAP. XLVIII.

Of the ſwarming of bees.

WHEN bees encreaſe, they naturally ſwarm. The time of this is the beginning of ſummer; and it is a ſeaſon at which the owner is to watch them with a particular care. The encreaſe of his ſtock and his profit depends principally upon his management at this juncture.

The fullneſs of the hive is the reaſon of their ſwarming. They ſometimes get a way of lying out of the hive, under the ſtool or behind; and in this caſe, not perceiving the hive to be full, they will not ſwarm.

The ſwarming depends on many accidents, and none more affect it than the weather. In a mild ſpring they ſwarm early: in a cold and backward ſeaſon they do not ſwarm well; and what they do is later.

Toward the middle of May, the owner is to watch the hives. When the drones are thrown out early, it is a ſign the hive is full; and when the bees after this are ſeen in cluſters about the door, and often lie out; and when there is ſome moiſture about the foot of the hive, at times, and they hover in great numbers together round the door, it is a ſign of ſwarming. When there happens a warm gleam of ſun, after a ſlight ſhower in the middle of a calm day, they may be expected to riſe; and if juſt after this they be ſeen hanging in cluſters about the door of the hive, it is to be immediately expected.

If the weather prove ſtormy when the bees are ready to ſwarm, it will prevent them; and if this happen from time to time, they will put it off entirely, and the opportunity will be loſt for that ſeaſon. Sometimes in extreamly hot and dry weather, they will lie ſo continually out, and ſo many of them together, that not perceiving the fullneſs of the hive, that alſo will prevent them from ſwarming.

As their own ſenſe of the fullneſs of the hive is the great reaſon, the owner ſhould force them in to it, in good ſwarming weather. He ſhould alſo ſhade and cool the hive at theſe times, if the weather be very hot. If thoſe which hang about the ſtool be gently moved off with a bruſh, it will cauſe them to riſe, and the noiſe of ſeveral of them flying up together, will ſometimes call out the others, and make them ſwarm.

When bees lie out in great numbers raiſe up the hive, and let them all in, and then faſten down the ſides with cow dung and ſand, leaving only the door open. This will make them perceive the fullneſs, and they will be led to ſwarm.

The good women have many idle cuſtoms for making bees ſwarm: but theſe are founded upon reaſon.

One ſwarm not ſufficiently unloading the hive, at eight or ten days diſtance, there will be another ready. Theſe are what they call after-ſwarms, and the owners know of their coming out by the noiſe. They call one another with a ſharp and ſhrill note, and preſently riſe in numbers.

When the firſt ſwarm happens to be broken, the ſecond will ſometimes come the next day, and after this there will come a third, and ſometimes a fourth: but all this happens within fourteen or fifteen days.

The country people are ſuperſtitious about bees, but we wiſh to break through thoſe idle cuſtoms. As ſoon as the ſwarm is riſen, they ring upon a kettle or pan; they imagine this brings them down, but nothing is more contrary to reaſon. Their ſwarming is an operation in the courſe of their nature, and they ſhould be left quiet while they are about it: all noiſe diſturbs them; if there be danger of their wandering, a little duſt is to be thrown among them, and it never fails to quiet and bring them down.

The beating upon kettles was invented as a ſignal to the neighbours, that ſuch a one's ſwarm was up; they did not know that it was of ill conſequence, and they have been followed in it by thoſe who have imagined it to be uſeful.

Sometimes a new ſwarm of bees will caſt another the ſame year; of this the huſbandman cannot be ſoon aware, but he is to watch as ſoon as he ſees the firſt ſigns of it, and follow them in all reſpects as the former ſwarms.

When the ſwarm parts, he is to act according to the diſtance at which the two bodies ſettle.

If they be within ſight, the beſt way is to diſturb the leſſer cluſter, and they will riſe and go to the greater: if they be out of ſight they muſt be hived ſeparately.

CHAP. XLIX.

Of the hiving of bees.

THE hives being ready, he is to get the bees into them in the following manner. They ſoon cluſter together, and when they are clung one to another, and well ſettled, they are to be got into the hive.

According to the bigneſs of the ſwarm he is to chuſe a larger or ſmaller hive. The bees will bear ſome diſturbance without reſentment, but they muſt not be too far ruffled; when they are angry their ſting is a ſevere weapon. It may always happen that ſome may be provoked in this great article of hiving, and for that reaſon the perſon who undertakes it ſhould be prepared againſt the danger. Let him have a net wove, with the meſhes ſo ſmall that the bee cannot get through them, and large enough to be put on over his hat, and fall down upon his ſhoulders. His face and neck will be thus perfectly defended, and he will be able to ſee what he is doing: let him put on a thick pair of woollen ſtockings, and gloves of the ſame ſtuff, drawn pretty high upon his arm. Then let him go to work ſedately and ſoftly, for any haſty motion diſturbs and angers the bees.

Let a cloth be ſpread upon the ground near where the bees are ſettled, and the hive laid upon it. Their common place of alighting is the bough of a tree, and if this be a ſmall one let the huſbandman gently cut it off; let him take it down quietly and lay it upon the cloth, and ſet the hive over it. This is the moſt familiar way, and none ſucceeds ſo well. When the bees have ſettled upon a larger bough, or otherwiſe diſpoſed themſelves, ſo that this method cannot be taken, the huſbandman is to ſhake them off into the hive, and then to ſet it upon the cloth ſpread for that purpoſe. If they light near the ground, the beſt way is to draw the cloth under them, and them ſhaking them off, to cover them with the hive. When any number gather at ſome diſtance from the hive, he is to move them gently toward it with a bruſh; and if they take to any other place, he is to wipe them off with the bruſh, and rub the place with wormwood; finally, the ſwarm is to be ſet as near as can be to the lighting place, and all left to be quiet.

Sometimes the ſwarms come late, and are ſmall; ſo that the beſt of them not ſufficient to fill the leaſt hive, the huſbandman is then to put two or three of them together in one hive; for otherwiſe they will be poor, and liable to accidents, and will rarely come to any thing. If two or three follow one another, though not on the ſame day, let him take them one after another into the ſame hive, and by thus joining them, and forming a tolerable body, they will become induſtrious and defend themſelves, which ſingly they would not do.

The method of joining them is this. Near the ſtool ſpread a cloth upon the ground in a calm evening, when it grows dark; then ſet two ſupporters for the hive, and knock down the hive out of which the bees are intended to be removed. Lift it up, and clap it between the hands, to get out the bees that ſtick to its ſides; then lay it down on one ſide by the bees: and over them ſet the ſwarm to which they are to be added, placing their hive upon the ſupporters. They will naturally riſe into the hive, where they will join the bees that are in it; and if any remain about the empty one, it is only diſturbing them, and they will follow the reſt. In this manner another ſwarm may be added to them, and one hive may be thus well filled with thoſe which would have ſucceeded very badly in two or three. When the bees are all got in, let the empty hive be taken away, and the full one placed upon a ſtool that night, or early the next morning.

There is another eaſy method of uniting two ſwarms, or more, which is this. Let the hive into which a ſmall ſwarm has been taken, be turned bottom upwards, and in that manner fixed to the bottom of the other hive with its ſwarm, faſtening up the joining of the two. The bees of that which is undermoſt will fly up into the other, and then the lower one may be taken away. In this manner a ſecond or third ſmall ſwarm may be added to the firſt, till it be encreaſed to a proper quantity. But this muſt be done before the bees have begun to make combs; for when they have once ſet to their work they are unwilling to quit it.

As ſoon as they are ſettled in the hive they get to work, and in a very few days form large and compleat combs.

When an old ſtock of bees are to be removed, a proper ſeaſon, and a proper day are to be choſen for that purpoſe. The beginning of October is the beſt time, but it may be done in February. Fair and ſtill weather ſhould be choſen for it; and an evening is the beſt time, when the bees are quiet.

CHAP. L.

Of the preſerving of bees.

BEES, for the greateſt part of the year, provide for themſelves; but in hard ſeaſons they ſhould be aſſiſted. They will repay the owner's trouble with intereſt.

One article that makes this the leſs expenſive is, that the number of bees at the time when this is wanted, is not nearly equal to what it is at other ſeaſons of the year. 'Tis only in winter they require aſſiſtance, and they are by that time greatly decreaſed by deaths, ſince their ſwarming. A great many die in autumn, and many more as the weather grows ſevere.

It is often proper to feed them alſo in ſpring. When the ſtock of honey is ſmall at this ſeaſon, nothing is better worth while than to feed them, and the beſt way is by conveying the food in a cane, or little trough, into the hive. The beſt food is a mixture of honey with ſweet wort, or new beer, and a little bay ſalt: this gives them the needful ſupply of nonriſhment, and makes them healthy and vigorous. Some give bread ſopped in ale, and they will eat it greedily: but the honey is the beſt, becauſe it is the moſt natural food.

The ſeaſon of ſpring feeding is in March. They begin then to breed, and if they have had a bad ſeaſon, and want food, they will not attend as they ought, to the producing their young, which is the moſt important of all conſiderations to him who wants to increaſe his ſtock.

Bees that want food in the winter often do not deſerve it. But theſe always repay the trouble largely.

We have ſhewn what methods are to be uſed for the keeping bees alive at all times, and making the moſt of their leſſer ſwarms; but we are yet to remind our farmer of guarding them againſt ſuch things as are offenſive; and preſerving them from what would deſtroy them.

All noiſe and diſturbance are to be as much as poſſible kept from them. Cattle ſhould be kept away by good fences, and the place of ſetting them ſhould be far from publick roads.

Smoak is very deſtructive of them, eſpecially that which riſes from the burning any thing upon the ground: this is eaſily driven by the leaſt wind juſt upon them, being on their level. All bad ſmells alſo do them harm, and render their habitation diſagreeable.

They muſt not be expoſed to their enemies, field mice will deſtroy them, and birds of many kinds will devour them.

In years wherein waſps and hornets are numerous, they alſo do great miſchief, entering the hives, and plundering them of the honey: to guard againſt theſe, ſet vials of ſweetened cyder near the hive, nothing tempts the hornet and the waſp ſo much.

Bees are often very troubleſome, and deſtructive to one another, by fighting. To ſtop this, cloſe up the hive: but if matters be too far gone to admit this remedy, the ſprinkling a little duſt among them anſwers the purpoſe.

CHAP. LI.

Of taking the honey and wax.

THE huſbandman keeps bees for honey and their wax. And we now come to making his advantage of thoſe products.

Of wax they make their combs, and in the cells of thoſe combs they lay their honey. The wax not being eaten would remain uninjured in the hive during winter; but this is not the caſe with the honey. It is the ſtore they lay up in ſummer for that ſeaſon; and the way of obtaining it in the largeſt quantity, is to find the time when the combs are fulleſt.

All ſummer they are collecting honey: in Auguſt the combs are fulleſt; and from that time the bees often eat more than they get. The end of Auguſt is therefore the proper ſeaſon for taking out the honey.

The old way is to kill the bees, and take their produce at this ſeaſon: but many methods have been invented for ſaving them. There is not any great purpoſe anſwered by preſerving them when their food is taken away, unleſs more care and trouble be taken about them, than the farmer can beſtow: we ſhall adviſe him to follow the old method, and deſtroy the ſwarm when he has taken their ſtores. This practice is not ſo cruel as it appears, for the life of the bee is very ſhort naturally; and with the beſt management they paſs but an uncomfortable winter after they are robbed of their proviſion.

At the end of Auguſt let the huſbandman conſider what he will keep, and what he will kill. He is to be directed by the age of the ſwarms: the beſt to keep being thoſe of one or two years ſtanding; or thoſe of three or four years, which, by reaſon of their not ſwarming the laſt ſummer are full of bees, and are the moſt likely to be good. The ſwarms of three or four years old which have caſt hives are to be killed, becauſe they are not like to continue; and poor ſwarms that are not worth feeding; and all light ſtocks, and ſuch as do not carry out their filth, or drive away the drones in good time. Theſe are the principal rules he ſhould take for killing all ſuch as are three years old or upwards, that have miſſed ſwarming the two preceeding years, and ſuch as are weak and eaſily plundered. He is not to omit a large ſtore, whatever be the condition of the hive: if he perceive any to be very full, as they will ſometimes in good years be down to the bottom, he muſt take theſe: they never can be better, and often one ſuch hive is worth three.

When theſe hives are marked, let a hole be dug in the ground nine inches deep, and nearly of the bigneſs of the bottom of the hive, and let the fine mould be piled up round the brim. Two hours before ſun ſet, take a brimſtone match as long and thick as a large ſkewer, fix it in the ſlit of a ſmall cleft ſtick, with a ſharp point. Stick this in the ground at the bottom of the hole, ſo that the top of the match may come within an inch of the level of the rim: if one be not thought ſufficient, another may be added, prepared in the ſame manner. Let the top of each match be lighted, and then ſet the hive over the hole. Draw the fine mould about the edges to keep in the ſmoak, and thus let it ſtand a quarter of an hour. In that time the bees will be all dead.

The hive is then to be taken into the houſe, and the combs are to be carefully ſeparated, taking them out one by one. The dead bees are to be bruſhed off with a feather, and the combs are to be broke each into three pieces.

A good deal of honey will flow naturally out of theſe, and this is to be kept by itſelf. It is called virgin honey: but the ſame name is given to the firſt honey of any ſwarm. Let this be put into a pot, and ſet by two or three days. In that time if there be any wax or other foulneſs among it, that will work to the top in a kind of ſkum, and is to be taken off.

When the combs will run no longer they are to be preſſed, and this way they afford a large quantity of what is called common honey. After they have been thus preſſed, they are to be waſhed, and when all the ſweetneſs is out of them, they are to be worked for wax. The liquor in which they are waſhed, aud the coarſer part of the honey, are uſually made into mead.

The combs are to be ſet over the fire in a large kettle of water, and boiled, ſtirring it continually about to prevent burning. When the wax is well melted, pour all into a ſtrainer, and immediately put it into a preſs, ſetting a veſſel of cold water under it; into this let the wax fall; and let the preſſing be continued as long as any can be forc'd out.

When all is got that will come, let it be taken out of the water, and moulded and worked up into balls in the hand; and after this let theſe balls be broken to pieces, and ſet over a gentle fire to melt. Let the wax be ſkimmed as the froth riſes, and then let it be ſtrained ſlowly through a canvas bag, and received in an earthen pan, or other mould, which is to be firſt rub'd over with honey.

This is to be ſet to cool very gently in a warm room, and when thoroughly cold, and taken out, the bottom is to be pared off, and it is ready to be ſold.

End of the FIFTH BOOK.

A
COMPLEAT BODY
OF
HUSBANDRY.

BOOK VI.

Of TILLAGE. In SIX PARTS.

I. *Of Plants, and their Nouriſhment.*

CHAP.

1. *Of the Roots of Plants; their Kinds and Forms.*
2. *Of the Extent of Roots.*
3. *Of the Manner of Roots receiving their Nouriſhment.*
4. *Of the Importance and Uſe of the Leaves of Plants.*
5. *Of Accidents ariſing from the Loſs of Leaves.*
6. *Of the Nouriſhment of Plants.*
7. *Reaſons for ſuppoſing the Nouriſhment of all Plants the ſame.*
8. *The Objections againſt the Nouriſhment of all Plants being the ſame, conſidered.*
9. *Reaſons for it deduced from the Practice of Huſbandry.*
10. *The Reſult of Experiments on Vegetation.*
11. *Of the changing of Crops.*
12. *Of the Diſtribution of the Nouriſhment of Plants in the Earth.*

II. *Of the Advantages of Tillage.*

13. *Of the ſeveral Methods of dividing the Particles of the Earth.*
14. *Of the Degrees of Tillage, and of the Uſe of Dung.*
15. *Of the joint Advantages of Manure and Tillage.*
16. *Of the Preparation of Wood Land for Corn.*
17. *Of the Preparation of heathy Land for Corn.*
18. *Of the Preparation of Land for Corn after the artificial Graſſes.*
19. *Of the Preparation of Land for Corn after common Graſs.*
20. *Of keeping Land in Heart by Tillage.*
21. *Of the Nature of the Improvement by Tillage.*

III. *Of the Implements of Huſbandry, and their ſeveral Uſes.*

22. *Of plowing.*
23. *Of the Form of the antient Plow.*
24. *Of the ſeveral Kinds of Plows in common Uſe in* England.
25. *Of the Uſe of the common Plows, and their proper Make.*
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27. *Of the Wheel Plow.*
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29. *Of the Management of a Plow in working.*
30. *Of the Advantage of Plowing croſswiſe on hilly Grounds.*
31. *Of laying Lands in Ridges.*
32. *Of the wet Lands on Hills.*
33. *Of the wet Land which lies level.*
34. *Of the Advantage of Tillage by the four coultered Plow.*
35. *Of the general Benefits and Advantages of Plowing.*
36. *Of the Benefit of converting Paſture into Arable Land, and of continued Plowing.*
37. *Of Harrowing.*
38. *Of the various Kinds of Harrows.*
39. *Of the Drill Harrow.*
40. *Of Rolling.*
41. *Of the ſeveral Kinds of Rollers.*
42. *Of the great Advantages of Rolling.*

IV. *Of the different Manners of Sowing.*

43. *Of Sowing in general.*
44. *Of the Depth at which Seeds are to be ſown.*
45. *The practical Method of finding the proper Depth for Seeds.*
46. *Of the Quantity of Seed to be ſown in the common and drill Huſbandry.*
47. *The Practice of different Places in reſpect of Quantity.*
48. *Of the Advantages the Drill Huſbandry receives from the Hoe Plow.*
49. *Of changing the Seed.*
50. *Of the ſuppoſed Change of Species.*
51. *Of the Effect of different Soils on the Growth of Plants.*

V. *Of Drill and Horſehoeing Huſbandry.*

52. *Of the Nature of Drill and Horſehoeing Huſbandry in general.*
53. *Of Drilling.*
54. *Of Horſehoeing.*

55. *Of the Benefits of deep Hoeing.*
56. *Of the different Appearance of Crops.*
57. *Of Drill Boxes.*
58. *Of the Wheat Drill and Turnip Drill.*
59. *Of the Hoe Plow.*

VI. *Of the Benefits of Drill and Horſehoeing Huſbandry.*

60. *Of raiſing Turnips by the Drill and Horſehoeing Huſbandry.*
61. *Of the Diſpoſition of a Turnip Crop.*
62. *Directions for Horſehoeing of Turnips.*
63. *Of the Quantity of Seed, and Advantages of the Crop.*
64. *Of raiſing Wheat by the Drill and horſehoeing Huſbandry.*
65. *Of the Number of the Rows for Wheat.*
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67 *Of the immediate Benefit of broad Intervals.*
68. *Of raiſing Saintfoin by the Drill and Horſehoeing Huſbandry.*
69. *Of the manner of ſowing of Saintfoin.*
70. *Of the certain Advantages of the Drill and Horſehoeing Huſbandry.*

The INTRODUCTION.

Of improvements in huſbandry, and the manner to undertake them.

WE now enter upon the greateſt article of the farmer's buſineſs: a ſubject of the utmoſt importance to the publick, as well as to his private conſideration; and tho' the moſt continually practiſed, the leaſt underſtood of all.

We have endeavoured to acquaint the huſbandman with the reaſons of his ſeveral practice, and ſhall more particularly than any other occaſion, attempt it here; becauſe there is no part in which improvements are more wanted, nor any in which they may ſo eaſily be made.

There is but one way of rationally ſetting about theſe; this is by underſtanding as well as obſerving the practice of others, and applying what may be diſcovered from ſuch reaſonable experience, to farther parts of the ſubject.

It is by this method we ſhall endeavour to enlarge the knowledge of the farmer on the preſent head; that he may know in what manner to undertake what reaſon and the experience of others ſhall ſhew him to be practicable, at the ſame time that it points out the certain utility and advantage.

We have inſtructed him in the preparing, planting and ſtocking his farm; he is prepared to enter upon the tillage of his land; and he is to conſider by what method that may be undertaken to his beſt advantage.

The old practices of huſbandry had their uſe, for every kind of tillage adds to the fertility of the ground; but in the courſe of an employment followed by ſo many perſons, and for ſo long a period of time, improvements have been made. To adhere only to the old methods, were to ſhut the door againſt knowledge; and on the other hand to admit all that have been propoſed among the new, were to perplex inſtead of informing ourſelves by experience.

All ſciences are imperfect at firſt, and by degrees they arrive at more perfection. The greateſt advances are made by frequent practice. Among the many who follow huſbandry, the greater part think no farther than to imitate the labours of their fathers: and of thoſe who have had the ſpirit to purſue the ſubject farther, too great a part have been carried away by fancy; and have laboured rather to eſtabliſh ſome new ſyſtem, than to add to real knowledge. Theſe are to be little regarded; but, too much reſpect cannot be ſhewn to thoſe who have followed utility in their ſtudies, and adhered to truth in the delivering their reſult to the publick. From theſe we are to hope for real improvements in the art; and we ſhall find in their writings the beſt foundation on which to build our reaſonable attempts for the carrying agriculture to a greater perfection.

Among the writers who may be uſeful, there is not one who deſerves greater praiſe than Mr. Tull, the author of the famous treatiſe on horſehoeing huſbandry. This gentleman has not only been of ſervice, but has done honour to his country, for the greateſt reſpect has been ſhewn to his writings, by thoſe who cultivate uſeful ſtudies in every part of Europe. His method has a great deal of reaſon and utility; but there are faults as well as excellencies in the book, and while we give the due praiſe, we are to caution the reader againſt too cloſe an adherence to all the propoſitions.

This author had a great deal of experience, and he directed his purſuits upon a new plan. He has furniſhed innumerable hints for improvements, and has carried many of them himſelf to a great degree of perfection: but he is too fond of the ſyſtem he wrote to eſtabliſh; and the uſeful diſcoveries with which his treatiſe abounds, are clouded by vague reaſonings, and often buried in a tedious prolixity. Theſe uſeful diſcoveries we intend to preſent to the reader, without his errors or his partiality; as they have been approved by thoſe foreigners who have adopted the practice, and as they ſtand confirmed by experience.

To this ingenious writer we owe the eſtabliſhment of horſehoeing huſbandry practiſed in ſome parts of England at this time, and with great ſucceſs in many other countries. In our obſervations on this head, we ſhall form the advice we give to the practical huſbandman, not upon this or any one author alone, but upon the reſult of their ſeveral opinions, and of the experience of thoſe who have brought their propoſals to a trial.

Mr. Du Hamel in his treatiſe on cultivation, has adopted what was uſeful in Mr. Tull; adding what himſelf had farther diſcovered, and retrenching that author's errors: what he did by Mr. Tull we ſhall do by him. It is thus the writings of one author are made uſeful by the labours of another.

The horſehoeing huſbandry owes its origin to a long neglected paſſage quoted by Mr. Evelyn. The moſt celebrated authors we find are not the moſt read. The paſſage is this, "Take ſome of the moſt barren earth you can find, powder it well, and expoſe it abroad for a year, ſtirring it about frequently: it will become ſo fertile as to receive and nouriſh a plant from the Indies, and will cauſe all herbs to proſper in the moſt exalted degree, and foreign ones to bear their fruit as kindly as in their natural climates."

If we add to this remarkable quotation the contrivance for ſowing, invented by Lucatello, an Italian, and publiſhed in the ſixtieth number of the philoſophical tranſactions, which in the eſſential points agrees with that propoſed by Mr. Tull; we ſhall find the foundation of horſehoeing huſbandry has been long ſince laid; and ſhall wonder that what had been ſo plainly delivered in books, was not before brought to practice.

The uſe that has been made of theſe diſcoveries and inventions ſince, and the improvements that are now carrying on in many parts of Europe, by the practice of this huſbandry, ſhew the great utility of books in proper hands: nor does the inventor or the writer deſerve more praiſe, than the perſon who brings what they have deviſed into real practice.

In our conſideration of tillage we ſhall explain this great improvement, taking that lateſt invented method firſt into conſideration, as there will be opportunities of explaining the nature of culture more from it, than from any other; and as in order to enter into the advantage of any method of huſbandry, there ſhould be firſt convey'd ſome general knowledge of cultivation; we ſhall premiſe ſome obſervations on this intereſting head. For the better underſtanding of theſe, we ſhall begin with explaining to the reader, who is not accuſtomed to theſe reſearches, the nature of the vegetables themſelves.

To underſtand in what manner nouriſhment may be conveyed to the roots of plants, he ſhould firſt be acquainted with the nature of thoſe roots. For this reaſon we ſhall follow the method of thoſe who have written moſt rationally on this ſubject, and premiſe ſome remarks upon the nature and texture of the ſeveral parts of plants as they regard the preſent enquiry: conſidering them only ſo far as their knowledge may be uſeful to the huſbandman.

BOOK VI. PART I.

Of the Parts of Plants, and their Nouriſhment.

CHAP. I.

Of the roots of plants, their kinds and forms.

ROOTS may be divided into two kinds: thoſe which ſpread under the ſurface of the ground, and thoſe which penetrate ſtrait down: the firſt of theſe we ſhall call ſpreading roots, and the other tap roots.

The roots which firſt ſhoot from the ſeed of a plant, are always of the perpendicular kind: they run ſtrait down into the earth, till they find it too hard for their proceeding farther. Where the ſoil is ſoft and deep, theſe penetrate much farther than is imagined. They will reach many yards into the earth.

When theſe are cut, they change their nature, and each divides into many others. This is not eaſily ſeen in plants growing in the earth, becauſe their roots cannot be taken up perfect; but experiments made on ſuch as are raiſed in clear water ſhew it.

All tap roots puſh out certain fibres, which ſpread in an horizontal direction: and theſe are the more vigorous, the leſs they are buried in the earth. The moſt ſtrong and ſerviceable ſpread always near the ſurface; and within that depth of the ſoil which is ſtirred by the plow and other inſtruments of huſbandry.

Theſe are of the nature of thoſe roots we call horizontal. Some plants have thus a main body which runs ſtrait down, and fibres growing from it: others conſiſt of theſe ſpreading fibres only, theſe run often to a very great diſtance from the plant; but in this caſe they become ſo ſmall, that they are hardly to be diſcovered, eſpecially when they are of the colour of the earth among which they lie, as theſe ſmall fibres commonly are.

A carrot appears to the incurious to have only one root, which is long, thick, and perpendicular, with a few ſhort fibres about it: yet this is found, on a more ſtrict examination, to ſpread a great number of fine ſmall fibres to a great diſtance every way. Theſe are its horizontal roots, they are of the ſame colour with the earth among which they run, and therefore they are not to be diſtinguiſhed but by a very careful examination.

This is the caſe alſo with other plants, and nothing is eaſier than to be convinced of it by an experiment which Mr. Tull propoſes. Let a piece of firm earth be dug in form of a long and narrow triangle, let the length be twenty yards, the breadth at the bottom of the triangle twelve feet, and at the top let it terminate in a point. In this let there be twenty turnips raiſed from ſeed, and let the ground be kept well hoed. When theſe roots are grown, if the turnips that ſtands firſt, or in the narroweſt part, at the top of the piece, be as large as that which ſtands at the bottom, in the middle of the broadeſt part, it will be a proof that the horizontal fibres ſent out by theſe roots, ſpread very little in ſearch of nouriſhment; for they cannot eaſily go beyond the part that is dug. If the turnips be gradually larger from the top to the bottom, it will ſhew that a turnip ſends out ſmall fibres to a great diſtance in ſearch of nouriſhment, and that it grows in proportion to the diſtance they can extend. This would ſhew that a turnip ſends out fibres, to at leaſt ſix foot diſtance every way, for there is nothing elſe to make the laſt root bigger than the others; and twelve foot is there the whole width of the ground that is dug. But if the firſt root be ſmall, and thoſe which follow in a line to the broader parts, grow gradually larger till about the middle, and from thence to the broadeſt part, continue much the ſame in ſize and vigour; then it will be found that a turnip ſpreads its roots three or four foot every way, according to the breadth of the piece of ground where they have their full bigneſs: and that it ſends them no farther.

Roots do not penetrate, in any conſiderable manner, into the hard ground at the edges of this piece, where it has not been dug. The experiment therefore, ſuppoſing this the event, would ſhew the great uſe of digging, hoeing, or plowing about roots, for furniſhing them with nouriſhment: and it would ſhew, that be the earth ever ſo well prepared, it is of no uſe to them at a greater diſtance than three or four foot every way; therefore we ſhould ſee by this, how much ſpace is uſeful to be left about a turnip.

This experiment may be extended to other roots as well as turnips, indeed to all other plants whatſoever: and it will ſhew, ſufficiently for all uſeful purpoſes, to what diſtance they ſeverally ſpread their fibres.

CHAP. II.

Of the extent of the roots of trees.

MR. Tull obſerves, that the roots of white thorn in an hedge, which has a ditch before it, penetrate below the bottom of the ditch, and riſe again on the other ſide, to the richer ſoil which lies near the ſurface, eſpecially if it have been wrought; and then ſpread horizontally for more nouriſhment.

The ſame obſervation has been made by Mr. Du Hamel, with reſpect to a row of trees, which ſeemed to be kill'd by a deep ditch that was dug at a little diſtance from them, in order to prevent their roots from ſpreading into the neighbouring ground; but theſe trees, in a little time, ſent down their fibres below the bottom of the ditch, which, when they had paſſed, they roſe again toward the ſurface, and ſpread themſelves through the ſoil that was wrought, to a great diſtance every way. The trees had faded at firſt, upon the digging of the ditch, but as ſoon as their new roots had got into the good ground, on the other ſide, they recovered.

If a ditch be dug lengthwiſe, at a ſmall diſtance from a young tree, and filled up with good earth, the roots of the tree will ſoon get into it, and will follow the direction of the ditch, extending themſelves in the freſh earth that fills it to a great length.

When trees are planted too deep in the earth, they languiſh till they have ſent up their roots into the upper part of the ground, where it is ſtir'd by culture; but as ſoon as they have got there they revive and flouriſh. The folly of planting trees too deep, appears from this obſervation.

Of late years the young trees planted about London ſucceed worſe than formerly, a good part of them dying, and other loſing their tops: I have generally found this to be owing to the planting them too deep. One would ſuppoſe all the arts ſhould be beſt underſtood near the metropolis, but that of planting is not: this hint may perhaps be uſeful.

Theſe and other obſervations which might be cited, prove that the roots of trees ſpread to a great diſtance, when they get into ground that has been ſtirred; and that they will run a great way, and take ſtrange courſes to find it. The roots of all plants do the ſame.

Leaves are the organs of tranſpiration, roots are thoſe deſtined for attracting and drawing the nouriſhment. In order to the growth of a plant, more ſap muſt be taken in than is tranſpir'd; and as all plants encreaſe in growth, it is plain this is done. If we look upon the great extent of ſurface in the leaves of vegetables, we cannot doubt but that the fibres of their roots muſt be extended in a like manner. Reaſon ſhews it ought to be ſo, and late obſervations and experiments ſhew it is. It has been aſſerted, that they run out in length as much as the leaves expand in ſurface, although they are not ſo obvious to the eye.

But ſome reſtriction is to be obſerved in this aſſertion. Plants tranſpire only in the day: during the night, they revive and imbibe the dews and rains, and what they thus receive contributes greatly to their encreaſe. There is no proof that either the tranſpiration or ſuction are proportioned to the ſurfaces of the parts; and for ought that is hitherto known, an inch of root may imbibe a larger quantity than an inch of leaf tranſpires.

But, however this may be, it is certain, that the roots of plants extend to a length, much beyond what has heretofore been imagined.

CHAP. III.

Of the manner wherein the roots of plants imbibe their nouriſhment.

AS the lacteal veſſels in an animal have their openings in the inteſtines, for taking in the chyle, the roots of plants have openings in their lacteals, or ſap veſſels, on their ſurfaces. But there is yet a great difference: animals can ſeek their food, while plants are obliged to ſpread their roots in the ſoil, where they ſtand to imbibe their nouriſhment. It is therefore neceſſary, their roots ſhould extend to a conſiderable diſtance, otherwiſe they would quickly exhauſt the earth.

The preſſure of the digeſted food againſt the inner ſurface of the inteſtines, contributes, together with the motion of thoſe parts, to the introduction of the nouriſhing juice of animals, into the lacteals: and in the ſame manner the efforts which theſe ſmall roots of plants make in extending themſelves among the little particles of fine mould; the preſſure of the wrought earth againſt the roots, and the reaction of the roots againſt the earth, as they encreaſe in bigneſs, and as that cloſes after the breaking by culture, anſwers, in ſome degree, to thoſe motions in the inteſtines.

To this, which is an obſervation of Mr. Du Hamel, we may add another great article; which is the effect of heat. There is heat in all things; in the roots which are to receive nouriſhment, and in the earth which is to give it: and this heat differs in degree almoſt every moment, as is ſeen by experiments. Things expand with heat, and contract with cold: therefore they are expanding and contracting, more or leſs, every moment. This gives motion and preſſure between the roots and the ſmall particles of earth continually, and this much better ſhews the analogy there is between the nouriſhment of plants and animals.

This is indeed the true ſource of the nouriſhment and growth of vegetables; and all that has been diſcovered by Mr. Tull, and thoſe who have followed his train of reaſons, joins to confirm it. Heat is the cauſe of all motion, and is doubtleſs the immediate agent in the hand of the Creator, for the keeping the whole frame of things in order.

What has been obſerved of the action of the earth upon the roots of plants, ſhews, in the ſtrongeſt light, the uſe of ſtirring and breaking the ground by culture, that the roots may the more eaſily make their way through it, and that it may preſs them as it cloſes after the breaking.

The roots of plants are always in the beſt condition for obtaining nouriſhment, when the ſoil is light and fine. If two young trees be pulled up, one from a light, and the other in a heavy ſoil, the tree which had grown in the heavy ſoil, has but a ſmall number of roots, and thoſe large and ſtrong; whereas that which has grown in a light ſoil has a vaſt multitude, and all ſmall and fine. To purſue this ſubject farther, let a tree be raiſed in pure water, where there is no reſiſtance at all againſt the ſpreading of the roots, and we ſhall perceive that they are nothing more than the ſlendereſt filaments.

The culture of a ſoil occaſions the roots of whatever is ſown in it, to be more numerous, and fine, and experience ſhews it is not from the large and thick roots, but from theſe ſmall ones, plants receive their principal nouriſhment.

When a root is cut it alters its courſe and direction. This gives the greateſt of all proofs, of the benefit plants receive from the digging about them. When a root is cut off, it does not extend any farther in its form, or courſe in length; but ſends out a great number of ſmall and fine fibres. From the cutting off one root, a number of others are produced, which are of the proper kind for drawing nouriſhment; and the ground is at the ſame time made ready to receive them, when this is done in digging about the plant. When the huſbandman digs or plows near his plants, he cuts or breaks off a great many of their roots: and inſtead of hurting them by this, from every one ſo broken, there grow a great number of others more uſeful than the firſt.

CHAP. IV.

Of the importance and uſe of the leaves of plants.

LEAVES are ſo neceſſary to the greateſt part of vegetables, that they cannot ſubſiſt without them. If we pull off all the leaves of a flouriſhing tree, it will commonly die. This is not always the conſequence; for we ſee trees ſometimes rob'd of their leaves by caterpillars, and they recover: but that is done gradually: moſt trees will die if ſtrip'd at once.

The leaves of a tree which are to burſt forth in ſpring, are formed in the buds in the preceding autumn: they are at that time very ſmall, but they are proportion'd to their uſe.

Beſide theſe, which may be called the autumnal leaves, there is a reſerve in plants for others: for when mulberry-trees have been ſtrip'd of their leaves to feed ſilk worms, in the beginning of ſummer; or when other trees have been rendred naked by inſects, there grows a freſh quantity in the place. This is a proviſion of nature in favour of trees and plants, that they may not always periſh by the loſs of ſo neceſſary parts.

Grew diſcovered, in examining the leaves of plants, that beſide the net work of longitudinal fibres, which form the courſe of the leaf, there are a number of veſicles fill'd with air. From this many have concluded, that the leaves were the lungs of plants; that they received the air from the atmoſphere; that this made its way through the plant down to its roots; and that it there produced an effect upon the ſap received from the earth, of the ſame kind with that it occaſions in the blood of animals.

Mr. Papin has publiſhed a great number of experiments, which ſeem to favour this doctrine. He ſays, that on putting a whole plant into the receiver of an air pump, it periſhes immediately on exhauſting the air; but that if the roots alone be immerſed in the receiver, and the ſtalks and leaves remain in the air, which may be eaſily contrived by letting them out, and ſecuring the opening with wax, the plant will remain alive a long time. This was propoſed by the author, and has been received by the publick as a proof of the reſpiration of plants, and that their leaves are the organs.

The experiments made by Dr. Woodward, Mr. Mariotte, and Dr. Hales, prove abundantly that the leaves are organs of tranſpiration, and that the greateſt part of the ſap imbibed by the roots, eſcapes through them. If we compare the quantity of ſap that is taken in by the roots and other organs, with the quantity let off by tranſpiration, we find the remainder is what is left in the ſubſtance of the plant.

The leaves of plants imbibe the moiſture of rains, and dews, and this is beneficial to the growth.

It is ſaid the nutritive juice receiving a certain preparation with the leaves, is thence diſtributed throughout the whole plant for its nouriſhment: but this ſuppoſes a circulation of the ſap, which is a thing not proved by experiments. Indeed it is much to be doubted, not only becauſe it has been advanced without proof; but becauſe there do not appear to be two kinds of veſſels in plants, as veins and arteries in animals; the one of which ſhould carry up the ſap, and the other bring it down again. All there ſeems to be in the motion of the ſap of plants, is a kind of tremulous and uncertain undulation, owing to the different temperature of the air.

Thoſe who argue for the circulation of the ſap, ſay, that according to the other doctrine, it muſt be ſuppoſed to be prepared by degrees as it riſes in the plant; and that there is not any experiment or fact to prove, that it is in a greater degree of perfection in the upper than in the lower parts: and it muſt be allowed ſurprizing, that the ſap received into the roots, ſhould be at once ſo perfectly prepared as to ſerve all the purpoſes of vegetation, and be able to ſupply with proper nouriſhment the ſeveral parts. Upon this plan of reaſoning, the aſſerters of a circulation of ſap ſay, it is altogether neceſſary for explaining vegetation, to allow that it paſſes through the leaves, returns thence through the body of the plant, and afterwards goes to the leaves again. This is ſpecious reaſoning, but there want experiments to confirm it; and, on the contrary, innumerable facts plead directly againſt it.

The tranſpiration of the leaves is all that is proved with certainty.

Whatſoever be the office of leaves, experiments ſhew they are of neceſſity to the whole; this is the huſbandman's material conſideration.

If one cut off half, or two thirds of the leaves of a young tree that is full of ſap, it will loſe its ſap in a few days after. The bark which before would eaſily ſeparate from the wood, will ſtick to it; and it will be impoſſible upon the very day after the cutting off the leaves, to perform upon it many of thoſe operations in gardening, which might have been done while they were there.

A willow, or poplar, will flouriſh for a great many years, and continue with a ſound trunk, provided it be left to the courſe of nature, and permitted to keep its head and branches; but, when one of theſe trees has the head cut off for ſhrowding, the trunk quickly decays and grows hollow. This is often owing to the wet that gets in at the parts where the head at firſt, or the ſhrowds afterwards are cut off; but if ever ſo much care be taken in the cutting, the tree does not continue ſound as it would have done in its natural ſtate. The heads and high branches of trees are what carry the great quantity of leaves; and the leaves of trees preſerve the very trunk in ſoundneſs.

On the ſame principle, injuries of the leaves of corn affect the ear. As ſoon as they are attacked by any diſorder, the whole plant declines. This is a proof like the former, that the leaves are of the utmoſt importance, and that the healthful ſtate of the whole depends entirely upon them.

The leaves of plants therefore are of the utmoſt importance: and ſo are the ſmall branches that ſupport them. Cutting, if it be done too cloſe, is for this reaſon certain deſtruction to the French furze, and many other ſhrubs; and to the ſame principle is to be referred the vaſt damage that is done to the ſaintfoine, lucerne, and clovers, when they are permitted to be eat down too cloſely by cattle, while they are young. The injury is of the ſame nature with that to trees by ſhrowding: they ſuffer extreamly while tender, though when their roots are well formed, and have ſpread far into the ground, they will recover it.

Our huſbandmen turn in their ſheep upon corn fields, when the young blade is too rank: we ſhall adviſe ſome limitations to this practice; and they will be founded on this principle, of the great and neceſſary uſe of the leaves to all plants, and the injury of cutting, or taking them off.

From theſe obſervations the huſbandman will be led to the reaſons of thoſe effects he ſees ariſe from culture. The roots of plants differ in form, and we ſhall find they alſo differ in their principal uſes. The tap roots which penetrate deep into the body of the ground, ſerve to keep the tree or plant firm in its place, and thoſe which ſpread in the upper coat of the earth, ſupply it with nouriſhment. One kind may be moſt needful to one ſort of plants, and the other to another; though every plant in ſome degree requires, and has the aſſiſtance of both. Nature has given them according to their occaſions, the oak and the walnut have vaſt tap roots to ſecure them from the violence of the winds, while humbler plants have the horizontal roots moſt conſiderable, for ſupplying their uſeful products with nouriſhment.

Nature anſwers different purpoſes by the ſame means, and often employs theſe tap roots alſo to draw nouriſhment. They are common in many plants which have no great head, as ſaintfoin and lucerne, and others; but in the general courſe of things, it is the other uſe to which they principally ſerve. In the ſame manner, the ſpreading roots deſtined to ſupply nouriſhment, aſſiſt alſo, and that greatly in keeping the plant in its place.

Theſe ſpreading roots grow to the greater length as they run nearer the ſurface of the ground, becauſe they are there moſt within the reach of rains and dews, and moſt under the influence of the ſun's rays: they extend farther and wider in proportion to the condition of the ground, and they always run fartheſt where the ſoil is moſt broken by culture.

We find leaves are of importance to the plant on a double account; as they diſcharge the redundance of juices taken in by the root, and as they contribute to its abſolute increaſe, by imbibing nouriſhing matter from rains and dews: theſe two offices are performed by the ſame organs, and thus nature reciprocally uſes them. They diſcharge the redundances by day, and they imbibe moiſture during the night.

What has been ſaid here concerning roots, is a matter of immediate concern in the cultivation of every kind of uſeful growth; and the knowledge of this effect of leaves will be of no leſs conſequence in the conſideration of many of thoſe particular vegetables, the cultivation of which will be hereafter delivered.

CHAP. VI.

Of the nouriſhment of plants.

NOTHING is more difficult than to ſay, what is the nutritive juice of plants: no queſtion has been more debated by philoſophers, and none with leſs ſucceſs. It would be natural to think this might be diſcovered by the nature of manures; but we ſee the effect only: nothing is more hidden than the cauſe.

We have ſhewn what are the ſeveral ſubſtances uſed as manures, and from many of theſe one would ſuppoſe, the ſap which is ſo evidently increaſed and enriched by them, conſiſted of ſalts and oils, ſuch as chymiſtry is able to extract from theſe ingredients: but the effects of many of the more ſimple manures, which are often equal to thoſe of the moſt ſeemingly powerful, ſhew this is not the caſe. We are the more confirmed in this, when we conſider that bare ſands will ſupport many plants; and that others may be raiſed in pure water; and that in either caſe they have the ſame qualities and virtues with thoſe raiſed in earth, dreſſed with the richeſt manures. This leads one to imagine, that the ſap, or abſolute nouriſhment, is a thing much more ſimple than we ſhould otherwiſe think; and that it obtains all this variety of taſtes, ſmells and qualities from the organs of the plant.

Mr. Tull is of opinion, that the nouriſhment, or as he expreſſes it, the food of plants, is nothing but the particles of earth reduced to a very fine powder. Others have had recourſe to ſalts as the great article of the nouriſhment of plants; and many have called in fire, air, and water, to ſerve the ſame purpoſe; ſome prefering one and ſome another of theſe, according to the ſyſtems they choſe to favour. But this has all been found imaginary, from the reſult of frequent trials. If we can ſuppoſe pure earth capable of being reduced to ſolution in water, or but of being ſo broken and divided by it, as to be in a condition to be received into the fineſt veſſels of plants, we ſhall adopt an opinion much more agreeable to reaſon, as well as to the common courſe of things, in ſuppoſing earth itſelf thus reduced to ſmall particles, is the very matter of the nouriſhment of every thing that grows on it.

All vegetables are finally reduced to earth by corruption, and to what ſhould a thing be thus reduced, but to that ſubſtance of which it originally conſiſted. The manures we add ſerve no other purpoſe than preparing that earth for entering theſe fine veſſels; and the utmoſt effect of them perhaps is nothing more than rendering the earths with which they are mixed, fit for that purpoſe.

All the rich manures contain a ſalt: and ſalts may have an effect in dividing the particles of earth, and thus preparing them for affording nouriſhing plants. Water may ſoften theſe particles thus rendered extreamly ſmall, and air and fire may put them in motion. In this light, fire, air and water may aſſiſt in the growth of plants, but it is earth that affords the ſubſtantial part, or matter of their nouriſhment. The plant may be killed by taking away the effect of fire, air, or water, but without earth it could not have its very ſubſtance. Perhaps it cannot live without the others; but without this it cannot exiſt.

The mention of ſalts, fire, air and water, on this occaſion, is unavoidable; becauſe all who have read upon the ſubject, have been accuſtomed to hear of them as the ſources of nouriſhment jointly or ſingly; but no knowledge was ever conveyed upon ſuch principles. They are neceſſary to be named becauſe they have viſible effects; but nothing is ſo idle as to ſuppoſe they eſſentially feed and ſupport them. Water in the condition we have it, will do this, but water contains earth; and it is by this earth, that plants are nouriſhed which grow in it.

We do not mean by earth, that ſimple elementary ſubſtance which chymiſts expreſs by the ſame word: on the contrary, we can extract all thoſe principles from plants, and we mean by earth on this occaſion, common mould.

That this is natural to plants is evident, becauſe it will not injure them: which all the other things pretended to afford them nouriſhment will. Too much ſalt will prevent their growth, too much water will kill them, and too much air and heat will dry them up; but too large a quantity of earth never does them harm. Indeed they may be injured by being planted too deep, becauſe their roots may be buried in ſuch a manner, as to be out of the reach of the air, rains and dews, and of the influence of the ſun's rays; theſe being neceſſary to their growth, although they do not afford them the real nouriſhment.

That earth is the nouriſhment of plants appears from this, that ſuch as naturally grow in the moſt diſtinct and diſtant places, are capable of being ſupported by any earth indifferently in either. Thyme will not grow in a bog, becauſe thyme does not love much wet, but the earth of the bog is not in fault, for that will feed it, if diveſted of its abundant water; and removed to another place. Let a parcel of the earth of a quagmire that bears nothing but ruſhes, be dried by the ſun, and placed at the top of a hill, and thyme will grow in it; and in the ſame manner let the earth dug from a hill be buried in a quagmire, and when it is well wetted, ruſhes will grow in that. 'Tis not the earth that differs: 'tis only altered by the quantity of water. The plants of America ſucceed very well in the earth of England: if they are from a hotter climate, they muſt have a proportioned degree of heat given by art, but our earth does perfectly well. We ſee good earth will ſupport and nouriſh all kinds of plants, provided they have the neceſſary degree of heat and moiſture.

'Tis ſaid that water, and even air, may be fixed and converted into earth; and ſome have imagined this of water particularly, from its ſo freely feeding of plants: but that is owing to the earth it contains. If we can get over the difficulty of earths not being diſſoluble in water, or can ſuppoſe that without ſolution it is capable of being rendered ſo ſmall, that it may enter the fineſt veſſels of plants; there appears great reaſon on the ſide of this opinion, that earth is properly and truly the food or nouriſhment of them.

The ſucceeding chapters on tillage will ſhew the neceſſity we have been under of entering thus far into the preſent ſubject: for otherwiſe, much of the practical part would have appeared ſtrange and ill-founded. But whether earth be the nouriſhment of plants or not, is to the practical huſbandman no important matter. If we can upon theſe principles lead him to a method of giving greater fertility to his land, we ſhall not be uneaſy about the uncertainty which reigns, and always will reign in the enquiries into the myſteries of nature: the explanation of the nouriſhment of plants being one of the greateſt.

CHAP. VII.

Of the reaſons there are for ſuppoſing the nouriſhment of all plants the ſame.

A Queſtion will naturally ariſe, whether we ſuppoſe the different ſort of plants take in the ſame food, or the ſame matter for their nouriſhment, whatſoever that be? this is neceſſary to be conſidered for the uſe of the practical huſbandman: for on the anſwer depends his knowledge how to act in the varying or continuing the ſame crops upon the ſame piece of ground.

The nouriſhment taken in by all plants is probably the ſame, for we ſuppoſe that nouriſhment to be no other than earth carried into their veſſels by water. But as a great deal of the huſbandman's practice will depend upon the certainty of this point, we ſhall not attempt to force the opinion upon him: but ſhall lay before him the objections that have been made, or may be made againſt it, and propoſe at the ſame time our anſwers. When he has the whole before his eye, he will beſt determine, whether he ſhall adhere to this or any other opinion.

Mr. Tull is the founder of this doctrine, that the food or nouriſhment of plants, is earth; and conſequently, that all plants take in the ſame. The generality of writers have adopted a contrary doctrine: they ſuppoſe every plant draws from the earth for its nouriſhment certain juices that are proper for it, and no other, never taking in the earth itſelf at all.

On this principle is founded the common opinion, that a piece of ground may be exhauſted for one kind of plant, and not for another; and on this opinion is ſuppoſed to reſt the cuſtom, of every year changing crops; the ſucceſs of which practice is alſo urged in favour of the opinion.

Barley, they ſay, exhauſts the ground more than oats, when it is to be ſown afterwards with wheat. This is a fact, and on this they found their opinion, that the juices taken for the nouriſhment of barley, are more like thoſe required by wheat than are the juices drawn by oats.

In the ſame manner they add, when a piece of ground has been a long time occupied by one kind of tree, if more of the ſame ſort be planted in it, they will ſucceed very poorly; but if trees of ſome other kind be ſet, there will be hopes of better ſucceeſs.

Theſe facts which we ſtate in their full ſtrength, allowing their truth, ſeem at firſt ſight to argue againſt the nouriſhing matter of all plants being the ſame: but, on the other hand, there are a multitude of obſervations founded alſo on facts, which ſtand as fairly for the opinion that it is.

Barley does really exhauſt the ground, on which wheat is afterwards to be ſowed, more than oats: but the fact is only that barley exhauſts ground more than oats. There is nothing in the ſuppoſed particularity. Wheat requires a great deal of nouriſhment, and it ſucceeds beſt after oats, not becauſe the nouriſhment drawn by barley was of the ſame nature that wheat required, or that drawn by oats different; but becauſe the barley had drawn more nouriſhment, and therefore had left leſs in the ground. We know barley requires more nouriſhment than oats, for oats will grow on poorer land: and this is the whole matter. The fact propoſed is true, but the cauſe has been miſtaken.

The other objection, if it were ſtated more particularly, would be as eaſily anſwered. Oats requiring little nouriſhment, will ſucceed after crops that require more; and that when the ſame crops would not. In the ſame manner ſome trees require more, and ſome will thrive with leſs nouriſhment. When one kind of tree that requires a great deal of nouriſhment has exhauſted a piece of ground, a freſh quantity of the ſame trees planted on it will not thrive, becauſe the former had impoveriſhed it: nor would any other kind of trees ſucceed, that ſhould require a great deal of nouriſhment. But if a kind of tree be planted there which requires leſs nouriſhment, they may ſucceed, becauſe though there be but little, it may be ſufficient for them, as they require but little.

A great part of the objections which are propoſed againſt uſeful diſcoveries, might be anſwered by more ſtrict enquiries in this manner; they have had their riſe in error, and they have their appearing weight only becauſe they are ſtated imperfectly.

CHAP. VIII.

Other objections to the nouriſhment of all plants being the ſame, anſwered.

THE principal difficulty they raiſe who ſuppoſe every plant to draw a peculiar juice for its nouriſhment out of the earth is, that it does not appear probable the ſame matter, and that alike in all reſpects, ſhould be able to ſupport and give increaſe to ſuch a variety of plants, and thoſe ſo different from one another; in their forms, taſtes and virtues.

This has a ſpecious appearance: but let it be conſidered fairly. There is no doubt but the ſmall particles of earth which we ſuppoſe to be the nouriſhment of vegetables, aſſume different forms in different plants; but this is no proof that the nouriſhing matter may not be the ſame in the earth, though altered in their veſſels.

Experience joins to ſhew, that the nouriſhment is the ſame for all plants, from their growth among one another. If a lettice draws from the earth a particular juice for its nouriſhment; and that juice be different from what is drawn by a plant of ſuccory, it will follow that a lettice ſet among ſuccory plants, muſt flouriſh better than when ſet among other lettices: nay, it ought in this caſe to flouriſh as well as if no other plant at all were near it: but let the experiment be tried, and the reſult will be quite otherwiſe. A lettice planted among ſuccory will flouriſh juſt as much as if it ſtood among other lettices; not at all more: and it will not grow nearly ſo faſt, as if no plant were by it. This ſhews the nouriſhment of lettice and ſuccory are the ſame; and that plants of any kind exhauſt the ground.

That the nouriſhment of plants, undergoes in their veſſels that change which gives it the particular taſte, colour, and form belonging to the plant, is evident from the common effects of grafting trees. There is an inſtance of Mr. Du Hamel's, in the memoirs of the French academy, which proves this abundantly, and in a very particular manner. A young citron of the bigneſs of a pea, was let in by the ſtalk to a branch of an orange tree. The citron grew to its full bigneſs, and became perfectly ripe, but it was to all intents and purpoſes a citron; having nothing of the orange in its nature, form, taſte, or appearance.

Now if the nouriſhment received by the orange tree could be thus prepared in the veſſels of the citron ſtalk, and fruit, what reaſon can there be to doubt, but that the ſame nouriſhment taken up from the earth, may be wrought in every plant into the colours, qualities and forms that are peculiar to that plant. Some contend not only that there is a particular juice taken out of the earth by each plant for its nouriſhment, but that every plant has more kinds than one. The pulp of a peach, the ſtone, and the kernel, they obſerve are very different things, and they ſay there ought to be three different juices taken up out of the earth to nouriſh them.

Theſe betray the cauſe by ſaying too much. Doubtleſs the organs and veſſels of plants give the different taſte and ſmell to the ſap, as well as occaſion its various other effects in the different parts. We do not find in the earth the taſte either of the pulp, of the peach, or of its kernel. There are ſoils that communicate a peculiar taſte to the fruits, but this is given equally to all fruits, and is perfectly different from their own, which each has beſide. The earth has a taſte, which it communicates univerſally; but the ſame effect is produced beſide in the veſſels of the ſeveral trees, and plants, as in other places.

In the moſt ſtrict examination of the roots of plants, we find no preparation for receiving particular juices. Grew ſhews that the ſurface of roots is a ſpungy ſubſtance, which muſt receive all juices alike; and that the ſurfaces of all roots are ſuch. Theſe ſpungy openings admit the fine particles of earth for nouriſhment, and the organs of the plant give them their differences in the various kinds, as well as in the various parts of the ſame.

Plants of the moſt different nature may be raiſed in water, and they will all have their particular forms, taſtes, and colours. Will theſe people ſay that there are in water different juices to be taken up by different plants? that were abſurd. We ſay there are particles of earth in all water, which is a known fact: and that theſe are taken in by the roots of plants for their nouriſhment: that they are in themſelves perfectly alike, and are taken up indifferently by all, but that they are changed in the organs of the plants, in order to give them their forms, taſtes, and colours: this ſurely is reaſonable.

The advocates for particular juices ſay, as there is a neceſſity for a diſtinct juice for nouriſhing each ſeveral part of the ſame plant: it cannot be but that the roots of every kind are ſo formed, that they will receive or admit no juices but ſuch as are appropriated to that plant; and that the ſeveral parts of the plant afterwards appropriate again ſuch juice as is alone ſuitable to them.

No doubt but according to the ſyſtem of different juices, this ought to be the caſe; the queſtion muſt remain whether it is: and on the deciſion of that, the whole objection will ſtand or fall. Mr. Tull has produced an experiment on this occaſion, the reſult of which, as he relates it, is altogether deciſive. The experiment is this. Set a ſtalk of mint in a glaſs of water: it will grow there and ſhoot out many roots. Let ſome of theſe roots be got out of the freſh water, and plunged into a glaſs of ſalt water: in this caſe the mint will preſently die, and its leaves will taſte ſalt.

In this caſe there is no doubt but the mint is kill'd by the effect of the ſalt water upon its roots; becauſe if the ſame roots had been cut off, the plant would not at all have ſuffered: and the ſalt taſte of the decayed leaves ſhews plainly, that the ſalt was the cauſe of its deſtruction. This fact reſts upon the credit of Mr. Tull, who has related it: and he aſſerts from it, that it is a proof that roots take in indifferently any nouriſhment that comes in their way, even when it is of a kind that will deſtroy the particular plant they are to feed.

CHAP. IX.

Reaſons deduced from the practice of huſbandry.

'TIS ſaid the practice of the huſbandman, and its ſucceſs, prove there are different juices in the earth for the nouriſhment of plants. Why, ſay they, are barley or oats ſown after wheat, and not wheat again, but that the wheat has drawn all the juice fit for its kind, ſo that the next crop of the ſame ſpecies would be ſtarved; whereas there ſtill remains the nutritive juice for barley, and that for oats, which therefore flouriſh, though a ſecond crop of wheat would not.

The real cauſe we have ſhewn already; it is, that wheat requires a large quantity of nouriſhment, ſo that there does not remain ſufficient for a new crop: but oats and barley require leſs: if it were true that barley grew well after wheat, becauſe the wheat had left in the ground the nouriſhment proper for it; then in conſequence a good crop of wheat might be expected after barley, becauſe the barley would have left in the ſame manner the juices proper for that, and the ground would be the ſame as if nothing had been ſown on it before. But this does not anſwer in practice, and we may therefore be ſure it is not true. Such a ſowing of wheat would yield a very bad harveſt. Wheat does not ſucceed except the land have had four workings: if barley were ſown in land ſo prepared, it would thrive greatly, but as it does not bear the price of wheat, nor neceſſarily require ſo much preparation, they ſow it after two.

Barley will grow upon land that has been impoveriſh'd by another grain, therefore it ſucceeds after wheat; but wheat will not thrive unleſs it have the land freſh, and thoroughly prepared to give it nouriſhment, and therefore wheat will not do after barley.

If every plant drew from the earth a particular juice, and no other; what occaſion could there be for letting the lands lie fallow one year in three, as is the cuſtom in common fields. They might only have a change of crop. If they ſowed wheat the firſt year, barley the next, and oats the third, and then peaſe and turnips; they might after this laſt growth ſow wheat again, the land having had five years to recover the nouriſhment of wheat: but this is not found in fact, nor is there any truth in the argument. The nouriſhment of all plants is the ſame, and is probably no other than earth in ſmall particles, and there is no other difference, but that one kind draws more of it than another.

Every one knows, that in ſuch a courſe as this, all the crops would grow worſe, till they would not be worth gathering: this is becauſe all crops exhauſt the earth of the general nouriſhment of plants, though in a different degree.

Reſt is not all that land has during the intervals of crops for its recruit. It is turned and worked, by which means the particles are anew divided, and there is a freſh ſupply of ſmall ones procur'd for the affording nouriſhment to the following growths. The texture of the mould is broken ſo, that it gives free paſſage to the roots of corn in new places; and by all this it is render'd proper for the production of plants which require a great deal of culture, wheat particularly: and during the whole time of this reſt and preparation, it is not exhauſted by uſeleſs plants.

If every plant drew from the earth a particular juice, and that of no other kind, then thiſtles, bluebottles, corn marygold, and the other weeds ſo frequent among corn, would do it no harm; becauſe they would take only ſuch juices as the corn would not, but the contrary is found in fact. All theſe plants injure the growth of corn, becauſe they all exhauſt the earth of its nouriſhment, which is the ſame for one and for the other.

If other plants did not draw from the earth the ſame nouriſhment with corn, corn might as well grow among the largeſt cluſters of them, as ſingly in a field: but we find it will not: and 'tis not to be pretended the ſtalks of the plant prevent this any way, becauſe ſo many ſticks of dry wood will do no harm.

CHAP. X.

The reſult of experiments in vegetation.

MANY have thought every thing that can be diſſolved in water, enters indifferently into plants; and that each ſeparate kind appropriates only what properly belongs to its nature, and lets the reſt paſs off by tranſpiration.

This, like the other reaſonings, has a very fair appearance, but it cannot ſtand before experiments. We can collect what paſſes off from plants by tranſpiration: Dr. Hales has done it, and the reſult has altogether contradicted this ſyſtem. Seeing what great quantity of matter perſpired, ſays he, I was deſirous to try if I could get any of it. I fixed glaſs retorts to trees of different kinds, taking in their boughs with the leaves on into the retort, and ſtopping up the mouth about them. By this means, ſays he, I got ſeveral ounces of the matter perſpir'd by vines, fig trees, apple trees, cherry trees, apricot and peach trees, alſo by rue, horſe-radiſh, rhubarb; and by parſnips, and cabbage leaves. The liquor of all of them was very clear, nor could I diſcover any different taſte in the ſeveral kinds: and the ſpecifick gravity was very nearly the ſame with that of common water. Here was a great variety of plants and trees try'd, and if there were different matters to be tranſpired, theſe certainly muſt have ſhewn that difference; but upon this fair experiment there appeared no ſuch thing, the liquor obtained from them was in all reſpects the ſame, it was perfectly like common water, and ſhewed no other difference from it, than that it would ſtink ſooner: this ſhew'd that it took ſomething from the plants, but the ſame from all. Having paſſed through their veſſels it acquired ſome vegetable quality, but that was the ſame from any plant. This experiment is the ſeventeenth in Dr. Hales's vegetable ſtaticks, it is eaſily repeated; but the authority of that writer is ſufficient to eſtabliſh it; and it overthrows that ſyſtem.

If each plant took up all that could be diſſolved in water, and tranſpired what it did not want, the ground would be continually exhauſted. For what was thus tranſpired would float in the air, and be at the mercy of the winds, to carry which ever way they chanc'd to blow.

There remains a farther obſervation to be ſtated.

When land which would no longer bear corn well, has, for ſome years, bore ſaintfoin or lucerne, it will again bear great crops of wheat. This may ſeem to ſhew, that the ſubſtance neceſſary for nouriſhing wheat, and that neceſſary for nouriſhing theſe plants is different; and conſequently that the food of plants is not the ſame. In farther ſupport of this argument it may be obſerved, that grounds laid fallow, to give them ſtrength for corn, bear in that ſtate great quantities of weeds. This ſhould ſeem alſo to ſhew, that different juices in the ground are fit for the nouriſhment of different plants; and that it is not the ſubſtance of the earth which ſerves for all: let not the induſtrious enquirer ſtop at appearances, but proceed to a deeper and a fairer ſearch.

Thoſe lands which are only left fallow, and have nothing done to them, do not improve either ſo quickly or ſo perfectly as if they had been tilled during that interval.

The greater part of thoſe plants which grow upon fallow lands, are weeds of ſlight roots which ſpread juſt under the ſurface, and do not penetrate to any depth; conſequently, when theſe lands are wrought, and the lower part of the ſoil is turn'd up, this is mould which has lain in abſolute repoſe. Now the contrary happens when ſaintfoin and lucerne are ſown, for they root very deep: but for that reaſon they do little prejudice to the ſoil near the ſurface. It is found by experience, that theſe plants draw their nouriſhment from a great depth, and leave the ſuperficial part of the earth unexhauſted.

Thus this obſervation ceaſes to be any objection at all. Weeds on fallows, exhauſt the ſurface only, and that ſurface is turned downward in plowing; ſo that the earth which is turned up for the growth of the corn is not exhauſted by them. It has lain its year in repoſe, and is now fitted for the nouriſhment of corn, by turning and breaking. Saintfoin and lucerne root deep, and draw their nouriſhment from the lower part of the land; ſo that a field cover'd with theſe graſſes, has the upper part of its ſoil in a ſtate of repoſe; and when that comes to be wrought and turn'd up, it is freſh and fit for the nouriſhment of corn, for corn is the moſt ſuperficial of all growths in its rooting. The caſe is not that weeds and ſaintfoin draw only a particular nouriſhment, that makes corn ſucceed after them; but it is that weeds exhauſt the ſurface which is turned undermoſt in plowing, and the others exhauſts the earth at depths whence it is never turned up for corn; and all the time of their growth, that part of the ſoil in which the corn afterwards is to grow, lies quiet.

Plants with tap roots do not ſucceed upon land where other plants with the ſame kind of roots have been. Lucern will not thrive after ſaintfoin; whereas thoſe plants which have ſpreading roots, ſucceed upon the lands that have born the deep-rooted ones excellently; 'tis plain therefore, theſe deep-rooted plants have exhauſted the earth of its nouriſhment at thoſe depths, but not at the ſurface: and it is extreamly probable, from all appearances, that the nouriſhment of all plants is the ſame, and that it is nothing but earth in ſmall particles. We ſee thoſe of any kind exhauſt this nouriſhment, according to the depth at which they root; and no otherwiſe. When it is exhauſted, the earth muſt be prepar'd in order to the giving more; and as it conſiſts only of ſmall particles of mould, any thing that breaks and divides the land anſwers this purpoſe. The air does this in fallowing; the plow does it in turning and labouring, and the different manures do it by fermenting the ſoil. All theſe things produce the ſame effect by ſeveral different ways, and conſequently in different degrees; but whatever will break and divide the particles of earth, will make it proper for the ſupport and nouriſhment of plants.

CHAP. XI.

Of changing of crops.

HAVING explained the nature of plants, and their nouriſhment, our farmer will underſtand the reaſons of all that ſhall be propoſed to him for practice; and, where any thing out of the common road is to be propoſed, this explanation is needful.

We find all plants are nouriſhed by the ſame ſubſtance; that every plant will exhauſt the earth of its nouriſhment, which would be fit for others of the ſame growth; and that a piece of land which was once fit for ſupporting a crop of any kind, will continue to nouriſh crops of that plant for ever, if it be properly tilled and managed.

This is an article of great conſequence, and perhaps little believed by the common farmers, but it is equally true with the others; and may, at any time, be prov'd by experience. Let thoſe who would deny it, firſt try.

It is not neceſſary to change the crop every year, upon the ſame land: and this makes way for a new method of huſbandry, and for vaſt improvements. It is on theſe facts that the horſehoeing ſyſtem has its foundation.

In following the common practice of huſbandry, there is a great advantage in the ſowing ſucceſſively different ſpecies upon the ſame land; but this is not owing to the ſuppoſed cauſe, that each exhauſts the earth only of its peculiar nouriſhment, leaving the proper juices for the others.

There are three cauſes which may occaſion this good effect of changing of crops. but all different from this ſuppoſed cauſe. The firſt is the various quantity of nouriſhment requir'd for different plants; a ſecond is the different formation of parts in each plant, ſome being much more delicate than others; the third is the different quantity of tillage which each kind of crop requires for the ground. Theſe are the real cauſes why a ſecond crop ſhould be different from the firſt, and a third from the ſecond.

All plants do not draw from the earth the ſame quantity of nouriſhment. There are poor and light lands which nouriſh rye very well, though they would not yield a crop of wheat, nor even of oats. On the other hand, there are plants which are able to plunge their roots into a hard ſoil, which others cannot penetrate. The roots of oats will penetrate a hard land better than thoſe of barley: therefore oats will grow with leſs tillage. Oats ſucceed tolerably well in many places, where the ſoil is hard, with only one dreſſing: whereas lands that are much lighter and ſofter, require two, in order to produce a good crop of barley.

From this we may conclude, that in following the common practice of huſbandry, ſome other corn ſhould be ſown for the next crop after wheat: becauſe wheat requiring ſeveral dreſſings, in order to yield a good crop; and requiring alſo to be ſown in the beginning of winter, or ſoon after harveſt, it would be impoſſible to give the land thoſe dreſſings, without which we know, from experience, it will not ſucceed. With reſpect to oats and barley, as they are not to be ſown till the following ſpring, there is time between the gathering the wheat harveſt, and that ſeaſon, to give the land the one or two dreſſings which they ſeverally require.

The years fallow that is given to prepare for wheat, affords opportunity for thoſe four dreſſings, and for all the advantages which the land receives from the air and rains, between one of them.

If any one ſhould take a reſolution of always raiſing wheat upon the ſame land, he muſt ſow it only every other year. The year between muſt be a year of fallow, and muſt be uſed for the giving the land its four dreſſings; and in this manner the ſame field would for ever yield large crops of wheat, without ever ſowing any other corn.

Mr. Tull produces an inſtance which ſhews wheat will not, in any condition, ſucceed upon land that has not received its proper number of dreſſings. He ſays, that on ſowing a piece of excellent land with wheat, in the uſual way, it grew ſo thick and heavy that it lodged, and little grain was got at harveſt: after this the owner ſeeing the richneſs of his land, thought it would bear this grain any way, and giving it only one dreſſing, ſowed wheat again, expecting, that as the growth would be now leſs ſtrong, he ſhould have a better harveſt; but he was diſappointed, he hardly obtained from it the quantity of his ſeed corn.

Wheat ſucceeds very well after turnips; and people from this have fancied, that the nouriſhment of turnips was different from that of wheat; this is owing to a very different cauſe. The great requiſite for wheats ſucceeding is, that the ground be very well dreſſed. Turnips are always ſown on ground that has been well work'd; and it is dreſs'd over again as they are growing, Therefore, when the wheat is ſown afterwards, it has a land more labour'd and dreſs'd than in the cuſtomary way.

Turnips exhauſt land very little, unleſs they be ſuffered to run to ſeed. Nor is this all: we find that the nouriſhment the turnip does exhauſt, is little more than water, ſo that leſs of the earthy matter going into them, the more is left afterwards for the wheat. This fact may be proved by experiments on the roots themſelves. If a large quantity of turnips be mixed with wheat flower, and made into bread, when the bread is weighed, there will be found little more of it than if the ſame quantity of flour had been uſed without the turnips.

If turnips are ſown upon a land intended for wheat, and eaten off before they run to ſeed, the land is better prepar'd for that corn by their growth, not being in any conſiderable degree exhauſted; and the cattle eating theſe turnips upon the ſpot where they grow, their dung and urine add greatly to the richneſs of the ground.

When ſaintfoine has grown upon a piece of ground, there muſt be care in introducing wheat upon it. This ground not having been dreſſed or turned for nine or ten years, while the ſaintfoine was upon it, will not be ſufficiently broken by one or two plowings. One or two will prepare the ground for oats: but more are neceſſary for the ſucceſs of wheat.

Although in the ordinary way of huſbandry, it is impoſſible to have wheat every year upon the ſame piece of ground, with ſucceſs; yet in the method of horſehoeing huſbandry, it may be done. All that we have been here premiſing, is for the explanation of that practice; from which, managed with prudence, he may, in moſt caſes, make a much greater advantage of his land than by the common methods. A crop of wheat may be thus advantageouſly raiſed every year upon the ſame ground. The means upon which this will depend are, to give it more dreſſings; to put the plant in a condition to ſpread their roots in this prepar'd earth in the moſt advantageous manner, for the obtaining the nouriſhment wherewith it abounds; to prevent weeds from robbing the crop of its nouriſhment; and to be careful not to raiſe upon the land more plants than can be ſubſiſted. Theſe are the principles on which the practice known by the name of horſehoeing huſbandry depends, and theſe are founded on reaſon.

CHAP. XII.

Of the diſtribution of the nouriſhment of plants in the earth.

THE great advantage of a year of fallow is, that it gives time for ſufficient dreſſings. Theſe muſt be given at proper intervals, for otherwiſe they have not half their effect. Between one dreſſing and another, the weeds that are plowed in ſhould have time to rot, and the earth muſt be new turned up to the ſun and rain. A ſecond dreſſing coming immediately after the firſt, would only throw up the ſame land again, undoing what the firſt had done in a great meaſure.

From this the conſiderate reader will underſtand not only the neceſſity of dreſſings for land, but the nature of their benefit.

However good a ſoil may be in its nature, the plants ſown in it can have little advantage from its richneſs, if their roots cannot ſpread and penetrate it to get at the nouriſhment. A ſoil that is too firm will not permit this, its riches are as it were locked up; and it muſt be broken by dreſſings. The vaſt fertility of garden ground is owing greatly to this continual ſtirring and breaking of it in digging, and we ſee all earth is fruitful that is frequently moved. We may therefore eſtabliſh it as a principle, that the more the ſmall particles of a ſoil are divided, the more its inward pores are multiplied; and it is in proportion render'd more fit for the nouriſhment of plants. We have ſaid how great things may be done in the improvement of land by manures, we now come to the article of dreſſings: on the proper underſtanding of thoſe two things depends all the knowledge of huſbandry.

The common practice reſts moſt upon manures; the horſehoeing huſbandry on labour and tillage: this is their great difference.

The nouriſhment of plants is ſpread throughout every part of the earth, but it would anſwer no purpoſe if plants were not able to draw it. To this purpoſe it is neceſſary, that they have the means of ſpreading the ſmall fibres of their roots between the particles of earth in a ſoil. Land in which theſe particles are preſſed too cloſe, or connected too firmly together, prevents this paſſage of the roots; but it is neceſſary that there be ſpaces between theſe particles into which thoſe roots may run. Moſt ſoils have naturally theſe inward pores, but frequently they are in too ſmall quantity, or they are not of proper kinds and paoportions. This is the natural defect of ſoils, and this is to be remedied by dreſſings.

When the pores are in too ſmall number, there is little communication between one of them and another; and the roots are ſtop'd in their paſſage; this is the fault of too ſtiff ſoils.

When the pores are too large, the roots go through them almoſt without touching the earth, they therefore can take no nouriſhment from it: this is the fault of too light ſoils.

Theſe defects may be remedied by culture; the earth contains ſo great a quantity of nouriſhment, that there is no need to fear exhauſting it; the only buſineſs is to put the roots into a condition of getting at it.

Neither are we to fear this nouriſhment, intended for plants, will be ſcattered and loſt of itſelf: experience ſhews there is no ſuch danger. If we dry a piece of earth ever ſo thoroughly, and then powder it fine; if we expoſe it in this ſtate to the ſun, rains, and froſts, it will not have its nouriſhing particles diſſipated or loſt by this; but all that management will render it more fertile. This ſhews the nouriſhment is real earth, water is neceſſary to be mixed with the particles of earth, and when this has carry'd up the nouriſhing particles into their veſſels, it is tranſpired through their leaves, leaving thoſe particles behind. This is the courſe of nature in the ſupplying of plants; but when water is evaporated from the earth, without paſſing with it into the veſſels of plants, it goes off alone, taking with it none of the nouriſhing particles. Lands left fallow grow more rich and fertile; whereas, were the water that is evaporated from them to carry the nouriſhing particles of the earth along with it, they would be rendered poorer by this practice.

In the management of land for giving it fertility, what we are to attempt, is not ſo much to provide plants with ſuch particles as are needful for their nouriſhment, as to diſpoſe theſe in ſuch manner that the plants can gather them up, with their roots. Almoſt all ſoils contain the nouriſhment of plants in abundance: the huſbandman is to put them into a ſtate fit to give it.

This is done by a proper dividing and breaking of the particles of the earth; this muſt be done in ſuch a manner, that thoſe particles may leave between them as great a number as poſſible of little ſpaces, into which the roots may inſinuate themſelves, ſo that immediately touching the particles of earth, they may gather from them thoſe extreamly fine and minute parts, which are their real and proper nouriſhment.

This dividing of the ſoil is to be done two ways, by manures and by tillage: we ſhall, in the ſucceeding chapters, examine impartially by which of thoſe means it may be beſt obtained; for on that depends the merit of one or the other kind of huſbandry. It is by underſtanding their different operations, the practical farmer muſt be directed in his choice, which method to prefer on any particular occaſion; and how to manage his ground to the greateſt advantage.

BOOK VI. PART II.

Of the advantages of TILLAGE.

CHAP. XIII.

Of the ſeveral methods of dividing the particles of earth.

THE means of giving fertility to a ſoil, conſiſts in the dividing and breaking of its particles. We are now to examine in what manner that effect may be beſt effected; and we ſhall do this with impartiality. The favouring a particular ſyſtem may miſlead men, but they are ſafe from prejudice who have no aim but the diſcovery of truth.

Beſide the two ways already mentioned, which are by tillage and manures, there is another to be remember'd here, which is heat, or the effect of fire. The difference of the three ways is this: tillage operates mechanically, breaking thoſe particles merely by the inſtruments employ'd in it; fire acts in the way of calcination; and manures by fermentation.

Dung, which is the principal, alters in ſome degree the nature of the productions; and there is another diſadvantage,

tage, which is, that we cannot procure it always in the needful quantity. It is always in our power to increaſe the tillage as much as we pleaſe, and this never alters the quality of the products. Dung and other manures may give ſome ſubſtance to the earth; but repeated dreſſings expoſe one after another, the different parts of the ground to the influences of the ſun, air and rains; and theſe render it in a more natural manner fit for the affording nouriſhment to plants.

The more we break the particles of earth, the more we increaſe the number of its inward pores: the more we increaſe the ſurface of thoſe particles, the more we put the ſoil in a condition to furniſh plants with nouriſhment: that is, the more we add to its fertility.

It is in our power to effect this by fermentation raiſed by manures, or by the inſtruments of tillage: the uſe of dung is limited, becauſe the quantity is limited; but the method by tillage is without limitation, becauſe we may always give as much as we pleaſe.

Dung ſpoils the taſte of the products in ſome degree: this is proved in kitchen gardens. The eatable plants raiſed with dung being much worſe taſted than thoſe without. Cabbages and pulſe are never ſo well flavoured in great towns, where they are raiſed with abundance of dung, as in the country where dung is ſcarce, and leſs of it is uſed to them. In wine countries this effect is the moſt obvious of all, the difference being ſurprizingly great between wine made from the produce of a vine that has been dunged, and that from grapes of the ſame kind where there has come none of that manure.

Theſe are the real and certain diſadvantages of dung, eſpecially when uſed in too great a quantity: Mr. Tull has carried this point farther. He attempts to prove that dung gives hurtful qualities to the plants raiſed by its aſſiſtance: but the fondneſs for his ſyſtem carried him in this beyond reaſon; and his arguments are not concluſive.

It is probable, a poiſonous plant would have leſs power when raiſed in a rich dunged ſoil, than in the pooreſt natural earth; for we find dung, though it increaſes the growth of plants, weakens their qualities.

Dung by fermentation makes an inward diviſion of the particles of earth, which muſt be uſeful in giving its fertility: but the inſtruments of tillage break thoſe particles, and at the ſame time change their place: they turn about the larger parts of the ſoil, and give them all the advantage of the ſeaſons, at the ſame time they deſtroy weeds. The improvement which is made by tillage has many advantages, whereas that made by dung has but one. The earth thus dreſſed is not exhauſted by uſeleſs plants; and it receives from time to time, and in all its parts ſucceſſively, the advantages of the dews, rains and ſun, all which we ſee, from manifold experience, aſſiſt greatly in giving fertility to land.

Dung draws inſects together which eat the produce. When trees are planted in a dunged ground, their roots ſuffer by inſects; and the curious in flowers have for the ſame reaſon baniſhed the uſe of this manure from their practice.

A very good method to remedy this evil, is to mix lime with the dung in the making up the heap. Let a layer of quick lime be firſt laid for a foundation, and then as the dunghil riſes by the addition of freſh quantities of dung, let there be here and there a layer of lime ſpread between. This will not only deſtroy inſects, but will kill in great part thoſe ſeeds of weeds which are one way or other received among the dung, and produce them too often in abundance among the corn.

It is repreſented as a great advantage of dung, that it is uſeful on all kinds of ſoils, the light and the heavy: and there are few exceptions to this. But the ſame is true of tillage: for it equally agrees with the ſtiff and the looſe ſoils, and gives fertility to them all.

Stiff ſoils have their particles ſo cloſe, that roots cannot penetrate them ſufficiently; and when they cannot penetrate and ſpread in the earth, the plant languiſhes. When theſe lands have been broken and divided by tillage, ſo that the roots find paſſage among them, and can ſpread as they ought to ſeek nouriſhment, they will be able to ſupply the plants with food; and we ſhall ſee the crop grow upon them with ſtrength and vigour.

The fault of light ſoils is, that they have too large ſpaces between their particles, and that many of theſe have not a communication with one another, ſo that the roots paſſing through theſe large cavities, do not reach their ſides; and, conſequently, not touching thoſe ſmall particles of earth which are the proper nouriſhment of plants, they cannot take them in, and of courſe cannot draw nouriſhment for the plant. The effect of tillage on theſe ſoils is this. It breaks the particles as in the other, and by that means multiplies ſpaces between them, making a great many ſmall ones inſtead of a few large ones. This it is obvious to reaſon muſt be the effect of breaking and dividing a light ſoil with large intervals; and this naturally qualifies it for affording nouriſhment to plants: for theſe ſmall ſpaces have their communications between one another, though the larger, from the nature of the ſoil, had not, ſo that the roots of plants can penetrate into them, and run through them as they ſhould; and at the ſame time touching their ſides every where becauſe of their ſmallneſs, they are able to take in thoſe extreamly minute parts of earth which are the proper nouriſhment of all plants.

In order to roots receiving their nouriſhment, there muſt neceſſarily be a kind of preſſure between their ſurfaces, and the ſmall particles of earth among which they run. This naturally happens when the ſpaces are ſmall, though it could not when they were ſo large as they naturally are in light ſoils.

CHAP. XIV.

Of the degrees of tillage, and of the uſe of dung.

MR. Tull has endeavoured to prove dung uſeleſs on all occaſions, as well as hurtful on many; and he is for baniſhing it from the practice of huſbandry.

But the fondneſs for his ſyſtem carried him too far on this article.

The origin of the horſehoeing huſbandry, is laid in that paſſage recorded by Mr. Evelyn, where it is aſſerted that nothing more is neceſſary than the thoroughly breaking and dividing the particles of earth, in order to make it capable of nouriſhing any plant. From this it appears that nothing more is needful to the giving fertility to a ſoil than the dividing its parts, and breaking the little lumps into which they form themſelves. This is true with reſpect to many kinds of ſoils, but it will not hold good of all. From this we ſhall ſhew the huſbandman, there is danger in his adhering to any ſyſtem or method too ſtrictly; for although the benefit of tillage, in the manner it is propoſed in the horſehoeing huſbandry, may be greater than that of dung on many ſoils, it is not on all. The farmer, to make the moſt of every part of his land, ſhould know every method of managing it; and he ſhould prefer that kind to each part which is ſuited to its nature. We have laid before him the old method by manures, we are about to propoſe the new huſbandry, which places a particular kind of tillage in their ſtead: and we ſhall ſhew him, that neither is abſolutely preferable, ſo as to render the other uſeleſs: but that one kind of management may do for one land, and another for another: we ſhall ſhew him where manures will be preferable to the breaking of the ground by tillage, and where tillage may be preferable to manures; and ſhall give him directions with reſpect to this tillage; as we have regarded manures: ſhewing in what degree the one, as in what quantity the other, may be uſeful to particular ſoils.

Mr. Evelyn has ſaid, that breaking a quantity of earth, and expoſing it to the weather, will render it ſo fertile, that it will ſupport any plant. The horſehoeing huſbandry, propoſes to render a ſoil fertile by breaking and dividing it with tillage. But Mr. Du Hamel declares, that the fact recorded by Evelyn is not univerſally true, and therefore diſputes the practice founded on it in ſome points, while he allows it its merit in others. He ſays the aſſertion is not true of all kinds of earth, for that he tryed it on clay, and found it did not ſucceed. He powdered a quantity of clay, and ſifted it through a fine ſieve; but after this, wetting it with water, it became as tough and ſtiff as it had been originally. This is the objection ſtated by Mr. Du Hamel, and though not ſo concluſive as he ſeems to think, it has its weight.

He has not on this foundation a juſt right to queſtion Mr. Evelyn's fact, for he did not fairly try the experiment. He ſays he powdered and ſifted the clay, but he does not tell us he expoſed it to the weather. This is a part of the true proceſs, and it ſhould be ſo expoſed a year. We have ſeen that fire in a proper degree renders clay fertile. We have obſerved alſo that the ſun and air have in theſe reſpects the effect of fire, only that it is brought about more gradually. Now in this caſe the powdering of the clay would have rendered it more fit to receive the influences of the ſun and air, and the continual ſtirring and turning of it, which is directed in the proceſs, would have expoſed every part of it at times to their effect; ſo that it is not eaſy to ſay how much the proceſs fairly tryed would have done toward the rendering even pure clay fertile.

However, although the experiment be ſtated imperfectly, and does not infer ſo much as Mr. Du Hamel intends; yet this may be properly ſeen from it, that clayey ſoils will not be ſo readily improv'd by this tillage as the loamy and lighter kinds. The tillage of the horſehoeing huſbandry alone, will be ſufficient for light loamy ſoils; and on the other hand, the farmer who has ſuch as are ſtiff and clayey, will do well to call in to its aſſiſtance the effect of ſand, and the other proper manures; and when it appears neceſſary of calcination.

It is in this prudent and moderate way we recommend the horſehoeing huſbandry to the practical farmer: and it is thus, and thus only, he ſhould admit the uſe of any new methods. Their authors or inventors are always partial in their favour; but that may be beneficial on many occaſions, which is not adapted to all.

Clayey ſoils are apt to grow ſtiff again, after tillage; unleſs it be aſſiſted by proper manures; yet we are not for that reaſon to ſay, that for clayey ſoils, manures are better than tillage; for none require ſo much. Both are required for theſe lands: a great deal of tillage to break them, and then good manures to keep them in order. Thus from very indifferent they become ſome of the beſt ſoils we have; and it is thus the farmer is to manage them. Here therefore neither the old huſbandry is better than the new, nor the new better than the old, but the true practice is to join them.

Manures are neceſſary to clays, after they have been divided by the tillage; and they are uſeful to light ſoils becauſe they want the matter of nouriſhment. They enrich theſe and they divide the other: they are neceſſary to both, and they will take double effect on both, when they are accompanied with good dreſſings.

CHAP. XV.

Of the joint advantages of manure and tillage.

THE world has been ſenſible of the uſe of manures at all times, and it is the farmer's intereſt to continue the uſe of them; not to neglect them for any other practice: but this does not make the horſehoeing huſbandry leſs uſeful. Where manures cannot be had in due quantity, this tillage will ſupply the place of them; and where they are ever ſo plentiful, it will be a means of giving them greater effect. The uſe of manures need not make the farmer leſs regard tillage; for the more the ground is divided by that means, the more effect they take.

Wheat, which is the ſtrongeſt corn, and requires the moſt tillage of land, ſucceeds better when more is given than uſual; and it is found by experience, that this may ſupply the place of manure. Four dreſſings are commonly given to the land for this corn, and the uſe of dung is added; if the farmer will give it eight dreſſings inſtead of four, it will ſucceed as well in moſt ſoils without dung. Theſe additional dreſſings coſt leſs than manures, and where they ſucceed, the effect is equal. They will at any time in part, and on many occaſions entirely ſerve inſtead of manure, therefore it will be certainly to the intereſt of the farmer to uſe them.

Thus it is eaſy to ſee, there may be improvements made in the common practice of huſbandry. The common tillage does not anſwer the farmer's purpoſe for ſtiff clayey ſoils. It breaks the earth in this caſe only into a kind of large lumps, with great irregular cavities between them; and ſuch a ſoil is not in a condition to ſupport plants well. For the farmer to uſe theſe lands to the beſt advantage, he ought to give them more than the common tillage; and by the repeated dreſſings in the horſehoeing huſbandry, he is to break thoſe larger into ſmaller lumps. By this means a ſtiff ſoil will be brought into the condition of a light one; and will be fitted for raiſing a good crop: manures are at that time to be added: they will be received into the body of the ſoil better than they otherwiſe could; and there will then require nothing more than a repetition of that practice which brought the land into this good condition, to maintain it in the ſame for ever.

Sand is a good manure for clay. This proves the advantage of tillage on ſuch lands, for ſand anſwers the ſame purpoſe in a manner with tillage. It breaks the ſoil, and lets in the ſun and rains, and gives paſſage to the roots of the crop. This is what tillage alſo does, it furniſhes no nouriſhing matter to the ſoil, but merely ſeparates the particles of the earth; or keeps them ſeparate when they have been broken by tillage: and this produces all the good effects we deſire.

Light ſoils are improved by dreſſings, but they need not to be ſo frequent on theſe as on the others. To theſe manures are wanted to give richneſs, as to the others to divide and to keep the ſoil divided: but we need not be afraid of exhauſting the fertility of theſe lands, by expoſing them to the ſun. Its heat evaporates only their watery parts, not that ſolid ſubſtance which is to be the nouriſhment of plants. All theſe lands are improved by dreſſings, whether it be from the breaking of their particles, making them more ready and fit to receive the dews and rains, and receive the influence of the ſun and air, or whether from the multiplying their inward cavities, ſo that they are fitter for the ſpreading of roots. From which ever cauſe it riſes, the effect is certain: and by theſe repeated turnings, weeds are deſtroyed entirely; whereas light ſoils are thoſe which in the common methods of huſbandry produce them moſt.

What is here ſaid may be eaſily proved by experiment. Let one half of a piece of ſuch land, be dreſſed in the common way, and the other perfectly broken and divided by the horſehoeing huſbandry: after ſome time let the whole field be turned again in a dry ſeaſon, and that croſsways, ſo that the land may be cut exactly in the oppoſite direction to what it was at firſt: we ſhall perceive by the eye the advantage of this thorough manner of dreſſing: for that half of the field which had been perfectly tilled before, will have a different aſpect, from that which was but careleſly gone over in the uſual way: and we ſhall ſee plainly, that the one has had the proper advantage of dreſſings, and the others not. We may find the ſame proof in the difference of crops on ſuch light land as has been well laboured, and ſuch as has not, but here it is obvious even to the eye.

Many break the particles of a ſoil with rollers. This does not deſerve the name of breaking in compariſon of what is done in the proper way by tillage, but it has its advantage. When the land is not too moiſt, it is a good method of preparing it for tilling; but in wet lands, the roller does more harm than good. Some ſuppoſe that they can ſupply the place of the proper tillage by frequent harrowing of their land after they are ſowed; but this ſcratching of the ſurface can do little good; and when the ground is wet will do a great deal of harm.

CHAP. XVI.

Of the preparation of wood lands for corn.

WHEN a piece of ground has not been ſown for a great many years, and is to be prepared for corn, it requires a particular manner of dreſſing. This is to be varied according to the condition in which the land has been before; ſome being heathy, others having lain in wood, ſome in paſture, and others in the artificial graſſes. Theſe all require their particular methods of dreſſing; and there are others whoſe natural humidity makes them demand a method different from all.

In the beginnings of agriculture, wood lands were often dreſſed for corn. A natural condition of an uncultivated country, is to be over run with wood; and in ſuch caſe many found whole countries who firſt ſet about their improvement. It was not worth while to fell the timber, for they would have had no market for it; ſo they ſet fire to it upon the ſpot, and the aſhes, aſſiſted by the action of the heat, were of great ſervice in the improvement of the ground: after this they had no more to do than to ſtub up the roots; make all level, and go to ſowing.

At preſent wood is valuable, and this land is to be treated in another manner. When a piece of wood ground is to be turned into a corn field, the trees are felled, the roots are ſtubbed up, and this is ſuch an advantage to the land, that it will anſwer in ſome degree the effect of the burning, and of the aſhes.

Coppice wood is a good preparation of land for corn: and it may often be worth while to plant coppices with this intent: but whether that be done, or the coppice or larger wood be only felled for this purpoſe, there is no land that anſwers more happily for corn.

The holes that are made in taking up the roots, and the reſt of the neceſſary digging, turn up and break the land in an excellent manner, ſo that half the labour of dreſſing is ſaved.

After the earth has been levelled, it is to be turned up once in autumn with the plow, the froſts of the ſucceeding winter kill the weeds, and break the particles of the ſoil; and after this no more is needful than a ſecond dreſſing of the ground in ſpring: the land may then be ſown, and will yield a vaſt produce.

Land that has lain in wood is not only fertile at firſt, but it continues ſo a long time. The trees have drawn their nouriſhment from great depths, and the upper part has lain in a manner unexhauſted, and the ſhade of the boughs has prevented weeds from growing in any great quantity. Beſide this, the leaves falling every year, and lying upon the earth till they rotted, have been a continual manure of the richeſt kind upon the ground: and the decayed branches have added to the fertility.

We are to look upon a piece of land that has been ſome years in wood, as if it had been laid fallow all that time. A good piece of ſuch land, will produce vaſt crops of corn for many years, without the aſſiſtance of manures; dreſſing it but moderately by the tillage of the horſehoeing huſbandry: and that which was originally of little value, and would not have produced corn to any advantage, with the moſt expenſive manures, when it has been laid ſome years in wood, anſwers beyond expectation. There are trees of one kind or other that will grow on any ground; and there is a certain and great advantage from them. We ſee the conſequences of that growth in the improvement of the ſoil, and both may be ſufficient to lead many who have lands which they know not how to bring to any value, to try them this way. In recommending this method, we illuſtrate the practice of horſehoeing huſbandry, ſhewing the truth of thoſe principles on which we have before ſaid it is founded. The roots of plants ſeek their nouriſhment near the ſurface; and trees penetrate for it deeper: this is proved by the readineſs of a ſoil on which trees have long grown, to yield corn: and we ſee in the practice by which it is prepared for this growth, the great and certain advantage of breaking and dividing the ground: the ſtubbing and digging in taking up the roots, ſerves in the place of ſo much manure to the land. The ſpade and pick-axe break the lumps and divide the ſoil, as well as the common inſtruments recommended in the new huſbandry; and the effect is the ſame; for the land is made fit for the bearing of corn.

CHAP. XVII.

Of the preparation of heathy land for corn.

BY heathy land, we mean waſte and uſeleſs ground, that produces weeds of the worſt ſorts, and is barren of what is good: ſuch as tracts of ground over-run with heath, broom, brambles, fern, and the like.

It is proper to burn theſe uſeleſs products upon the ſpot, which is ſerviceable, not only becauſe the heat improves the ground, and the cinders ſerve as manure, but the immediate effect of the fire upon the roots is a great benefit, nothing ſo perfectly deſtroying them; nor any other practice ſo thoroughly ridding the ground of the fear of their after-ſhooting. As the ſeeds are conſumed, and the roots deſtroyed, by this practice, there is great reaſon to believe they will never riſe again, and this is of the utmoſt concern, becauſe they are dreadful enemies to all uſeful growths.

We have cautioned the farmer, that in burning ſtubble upon the land, he does not fire his hedges; but a greater care is needful here. In firing the growth of theſe waſte commons, the quantity is ſo great, that the body of flame is capable of ſpreading to do vaſt miſchief. The firſt care muſt be to know, before the fire is lighted where it will ſtop.

When a heathy piece of ground is to be fir'd, the right method is to clear away a good ſpace where it is intended to ſtop, by cutting up the furze: this will ſtay the progreſs, though nothing elſe can. The ſtuff that is cut up, being dried, will ſerve to begin the fire, ſpreading it at the other end of the ground.

A tolerably calm ſeaſon ſhould be choſen, and the fire watched as it burns. If it any where at the ſides threatens to exceed its limits, the method is to dig a little ditch, throwing the earth upon the fire. This will preſerve the reſt; for earth is a much more ſudden and certain quencher of fire than water.

When the ſtuff is burned, the roots of the furze and heath are to be dug up with a pick-axe. The land is then fit for the common practice of huſbandry.

The beſt ſeaſon for burning the buſhes is autumn, and as ſoon as ſome rains have fallen, the ground is to be turned up in large furrows, by a ſtout plow, it is thus to lie till ſpring; and then, after another plowing, it ſhould be ſown with oats; the ſecond year it is to have three good dreſſings, turning, cutting, and breaking it well every time; and the third it will be in a condition to bear wheat, without any addition of manure.

The ſingle article of labour, after the firſt aſſiſtance of burning, does the whole buſineſs; but this labour muſt be well performed, and ſufficiently repeated: for as the fertility depends on breaking the lumps, they muſt be well broken, and nothing but this thorough tillage can prevent weeds from taking poſſeſſion again of the ground. Notwithſtanding they have ſeemed ſo perfectly deſtroyed, they will, after ſeveral years, recover, to the deſtruction of all uſeful growths, if they be not kept down by tillage: but this method if properly attended to, will never fail. The winter turning expoſes the roots to the froſt, which nips them, and the ſummer turnings ſpread them before the ſun, which burns them up. In general, it is one vaſt advantage of this kind of huſbandry, that no other whatſoever ſo perfectly deſtroys weeds of all ſorts, and that in all lands.

CHAP. XVIII.

Of the preparation of land for corn, after the artificial graſſes.

AS it may be often proper to prepare an indifferent land for corn, by planting it with coppice wood, the ſame advantage may alſo be obtained from the artificial graſſes that root deep; and from none ſo much as ſaintfoin. This penetrates very deep into the ground, and draws very little of its nouriſhment from near the ſurface. The planting a piece of ground with coppice, is a kind of fallowing, with reſpect to the upper part, and the ſame is the caſe with theſe deep-rooted plants.

Many have been ſurprized to ſee ſaintfoin grow ſucceſsfully upon ſtony grounds, which have but a very thin coat of ſoil; but this inſtance, when well underſtood, is the greateſt proof that can be brought that this graſs draws its nouriſhment deep, and that it will not exhauſt the land near the ſurface, which is the ſeat of nouriſhment for corn.

When there is this ſtony bottom to a thin ſoil, it is uſually looſe, ſlaty, or cracked toward the upper part, where it riſes to the bottom of the mould: theſe cracks and openings, contain mould of the ſame kind with that above. The ſaintfoin ſends its roots into theſe crevices, and runs among them to a great depth. From the earth that is lodged in theſe it obtains its nouriſhment, and ſcarce draws any from the thin coat of pure mould above.

Theſe lands when kept conſtantly in tillage, ſucceed very ill, becauſe the quantity of ſoil is ſo ſmall; for the roots of corn never penetrate among the ſtones, but the raiſing saintfoin on them, ſerves as a kind of fallowing. After this herb has grown ſeven years on them, which it will very well do, they will yield three good crops of corn, and may then be laid down to ſaintfoin again.

Theſe deep-rooted graſſes are of the ſame benefit to all ſoils: ſome may want the aſſiſtance more than others, but they are uſeful on all: and after great crops, they prepare the land for corn better than almoſt any other method.

If a piece of rich land be drilled with ſaintfoin, ſix gallons of ſeed being allowed to an acre, and ſowed in nine inch rows, it may be mow'd annually with great crops; a ſingle crop ſometimes yielding four pounds an acre. After it has ſtood thus ſeven years, the land may be plowed up, and will be ſo rich, that inſtead of requiring to be fallowed or dunged for wheat, the farmer will be obliged to ſow that upon barley ſtubble, and to turn in his ſheep in ſpring upon it, to prevent its being too rank.

This may ſerve as a proof of the vaſt advantage of preparing land for corn by theſe artificial graſſes; for ſaintfoin will be not only in full perfection ſeven years, but would be able to ſtand much longer; and no fallowing would have prepared the ground for corn ſo well.

The beſt method for preparing the land for corn after this growth is, by firſt ſowing it with turneps; and we would have the huſbandman go through it in this manner. Let him plow it up in winter with a four-coulter'd plough, and get it in order for ſowing of turneps the following ſeaſon. When they are in growth, let them be well hoed; and let them be afterwards eaten by ſheep, upon the ground. This will bring the ſoil into excellent order for barley, the following ſpring.

The farmer will often find it anſwer his purpoſe, to raiſe ſaintfoin upon a piece of ground for a continuance. In this caſe, when it grows old he muſt take it up, and ſow corn to prepare the ground again. The method we have here directed is the beſt he can follow for that purpoſe: when he ſows his barley it may be done by drilling, and the ſaintfoin with it.

The ſame preparation anſwers when the land is intended for corn for a longer time. In this caſe let the huſbandman ſee the ground be very well tilled, otherwiſe the firſt crops will be poor. Saintfoin prepares land excellently for corn, but there muſt be good tillage at the breaking of it up, or elſe the advantage will not be obtained. Even oats will not grow upon it to profit, without good tillage. Some have ſown a broken-up ſaintfoin ground with white oats, after once plowing: but if the ſummer prove a dry one there will in this caſe be no crop at all, and if the ſeaſon favour ever ſo much it will be a very poor one.

From theſe inſtances, ſome have been led to diſpute whether the artificial graſſes do, in reality, enrich land or not: but thoſe who will not follow proper meaſures, are not to deny the effects that would have enſued if they had. Thoſe who have taken proper care in the ſucceeding tillage, have always found theſe graſſes left the land fit for any produce. This is ſo plain in fact, that it has been uſed againſt the ſyſtem of earth being the nouriſhment of all plants.

It has been ſaid, becauſe ſaintfoin leaves the land rich for wheat, therefore it draws a nouriſhment different from that of wheat, leaving what would have been drawn by wheat all there: but this we have ſhewn to be an error.

Some have ventured to ſay, this deep rooted graſs ſpreads no fibres in the upper ſurface of the earth: and therefore leaves it unexhauſted: this is one great reaſon; but they carry it too far, who ſay this graſs ſends out no fibres into the upper part at all.

Saintfoin has a ſingle long and large root which penetrates, counting the extreameſt fibres at leaſt fifteen foot deep into the ground, and it doubtleſs draws a great part of its nouriſhment from great depths. The plant does ſend out roots into the upper ſoil, but that is a ſmall part of the ground among which it ſpreads, and only a proportional ſhare of its nouriſhment is derived thence; ſo that the caſe being fairly ſtated, this ſoil enjoys a kind of fallow, becauſe it affords but a fifteenth part of the nouriſhment to the growth that is upon it. This is the true ſtate of the caſe, and they wrong a good cauſe who would make it otherwiſe.

We allow therefore that theſe graſſes draw ſome nouriſhment from the ſoil in which corn is to grow, but this is in ſmall quantity, and it is over-ballanced by another conſideration, which is the ſecond crop, or after-leaſe, being eaten by cattle upon the ground. There is a great deal in this, ſo much, that there is reaſon, as well as experience, to ſhew that a piece of ground planted with theſe artificial graſſes, and properly managed in the uſe of them, and in the tillage afterwards, is left in as good a ſtate by this growth, as if it had been in fallow. The lower parts of the earth indeed are not ſo fertile as the upper; ſo that the roots of theſe graſſes cannot draw ſuch nouriſhment from them as from the others; but though this lower earth is not ſo rich as the upper part, yet being freſh, and never exhauſted, it will ſupply a great deal to the firſt roots that come there: thoſe of corn never pierce to it, ſo that the roots of theſe graſſes will have nouriſhment.

CHAP. XIX.

Of the preparation of land for corn, after common graſs.

COMMON graſs has not this advantage in preparing land for corn, becauſe its roots do not pierce to any depth; but the ground is notwithſtanding ready to bear corn in abundance after this growth, provided it be good in its own nature.

One reaſon why paſture ground retains a richneſs to ſupport any crop, is, that in plow'd lands the rains waſh away a great part of the fine mould; whereas all is retained in thoſe covered with ſward, and whatſoever is brought on by accident with it; as the waſh from higher grounds, and the mud from the over-flowing of rivers.

For theſe reaſons a good paſture ground is always ready for corn.

The proper ſeaſon for preparing it for this is in the month of January; and the farmer ſhould take an opportunity to do it after rains, for when the land is well wetted, the turff is tough, and will turn without breaking.

An experienced plowman ſhould be employed; and the eye of the maſter ſhould be over him, to ſee he lays the turff flat.

A good plow ſhould be uſed on this occaſion; for without that no art will make the work go on well. If the earth board do not turn it well, a piece of wood muſt be nailed on it, to take the upper part of the turff as it riſes; this will throw it regularly over with the graſs ſide downward.

The advantage of this is the rotting of the graſſy part, which becomes a kind of manure. But this is only the firſt ſtep toward the preparing the land for corn. It is to be compleated by repeated plowings, and the more it has, proper intervals being allowed between them, the better it will be fitted for the growth of corn.

This breaking of the ground, is what we mean by tillage; and theſe repeated plowings are called dreſſings of the land. Many uſe the ſame word to expreſs the laying on of manures; here it means only the turning or breaking of the ground.

Every time the earth is turn'd, the particles of it are broken, the more the better; and it is on this principle that plowing of lands that have fed a large ſward of graſs, prepares them for corn.

The nouriſhment of all vegetables is fine earth, which they imbibe from the ſurfaces of the little particles among which their roots ſpread and run. When theſe roots have taken up all the fine and ſmall mould that lay about the ſurfaces of thoſe particles where they ſpread, the ſoil is ſaid to be exhauſted. It may be renewed by the addition of manures, which ferment and divide its parts, or by the action of the plow which breaks them; either way they are broken, and conſequently new ſurfaces are made. Theſe have new earthy particles upon them, ready to be abſorbed by the roots of a new crop: therefore a new crop thrives, being ſown upon that land.

This is the doctrine of exhauſting and refreſhing of land; and it is of the breaking it by the plow we ſpeak in this place. It is done in ſome degree by every plowing, but moſt perfectly by the beſt, and moſt frequently repeated. A ſlight plowing moves and divides the particles, without breaking many of them; but ſtill this is of ſervice: for where they are ſeparated, though not broken, there is a new ſurface at the diviſion, and this anſwers ſome purpoſe though 'tis not ſo much as will be done by better plowing.

In the preparing a common paſture for corn, there muſt be careful and good plowing, becauſe the ground has lain a great while undiſturbed, and the ſurfaces of its particles have been well drain'd of their nouriſhment by the graſs. Theſe ſurfaces could not yield nouriſhment for corn; but when the ground is well turn'd and divided, the particles are broken, new ſurfaces are formed, which the graſs does not now exhauſt: the corn finds it improved by the effect of the rotted graſs. This agrees with our plan, which is not to prefer one method before another, but to uſe both.

If any wonder that land ſhall be refreſhed by tillage after repeated crops, as ſuppoſing this turning and breaking of the particles, when repeated ſo often, muſt come to no more than the turning up the old ſurfaces again, he errs greatly, for the earth is diviſible without end, and no art could bring about what he ſuppoſes to happen by accidents: the ſame ſurfaces never can appear again in a thouſand plowings, becauſe the particles of the earth form every time new combinations; and every new ſurface anſwers like the firſt; all ſupplying nouriſhment equally.

Every ſoil that will bear good graſs, will alſo ſupport corn. Nor does any kind diſable the farmer from having recourſe to this aſſiſtance of tillage, it agrees with all; on light lands two or three additional plowings will anſwer the ſame purpoſe as dunging; and the coſt is not more than a fifth part. This is ſo plain from the trials that have been made, that it is getting into practice in ſome places, and has obtained the name of double plowing.

If a field prepared for barley in ſpring, be not ſowed with that grain, but plowed on to wheat harveſt, the crop of wheat from it will be very great: and when turneps fail one after another by the fly, the ground thus frequently plowed, bears wheat admirably without dung.

People that are ſlow to take advice, will be led by experience; and this is the moſt plain imaginable. From this it is evident there will require no aſſiſtance to the plow in preparing graſs land for corn, only let plowing not be ſpared. The work ſets out with a natural manure, and it will be a great while before the land requires any other: but when it does, let not the fondneſs for a plowing ſyſtem deny the uſe of it.

CHAP. XX.

Of keeping land in heart by tillage.

WE do not recommend tillage only, for keeping land in condition to bear corn, though that has been propoſed as poſſible, and is ſupported by ſome experience. Plowing may do this alone, but the aſſiſtance of manures will make it anſwer better. And ſometimes one method, and ſometimes the other are to be uſed, according to the circumſtances.

We ſhall now tell him what may be done by this method alone.

As new broken earth is the ſame thing with freſh earth, provided it be ſufficiently broken, there is no queſtion but tillage will ſupply the place of manure: for it will always break the ſoil. Light ſoils, when well broken by tillage, become cloſer and heavier, becauſe it brings their parts nearer together; and heavy or ſtiff land is made lighter by it, becauſe the breaking and dividing of this, naturally renders it leſs tough, that ſalt being nothing but the too great coheſion of thoſe particles. But to obtain this advantage for either, the tillage muſt be ſufficient: ſtiff lands half tilled, have large cavities, which is the very fault of too light ſoils; and an imperfect tillage of a light ſoil leaves it rough, and very much of the ſame nature with the half tilled ſtiff land:

both being in this condition, full of large pores, which are not proper for the nouriſhing of plants.

We mean to ſhew the practical huſbandman, who ſhall in any reſpect depend on this method, the neceſſity of ſufficient tillage: if he do otherwiſe he will deceive himſelf, and perhaps blame that practice which he has not followed.

Light land, ſuppoſing it to have been in graſs, becomes lighter for an imperfect tillage; the pieces of turff that remain turned under and not broken, make large hollows, and render it worſe than it was before the tillage. But when the farmer finds he has hurt it by this method, let him not be diſhearten'd, but go on; let him till it more; till all theſe pieces of turff are broken, and it is altogether fine, and he will then find it anſwer very fully to his expectations. This kind of land has an advantage over the ſtiffer ſorts, becauſe it is to be tilled with leſs labour and expence, working eaſily: and it anſwers excellently, for it becomes ſtronger than at firſt, and is often more profitable to the farmer than land of a better kind, which requires more laborious tillage.

In very light ſoils crops ſuffer in dry ſeaſons; and eſpecially after rains have fallen for ſome months, and theſe very dry ſeaſons ſucceed. This accident happens in proportion as they have been imperfectly tilled; and when the due care is taken, not at all.

The large cavities, when the ground is wetted by long rains, are full of water, and that water touching the roots in every part, ſupplies the plant with nouriſhment; but when the dry weather follows, and they become empty, the roots do not touch their ſurfaces, and cannot be nouriſhed, ſo the plants fade and decline. But good and perfect tillage prevents the earth from having theſe large cavities, and therefore remedies this evil. The way to bring them to good, is by the beginning with deep, thorough plowings; and the way to keep them in heart is to repeat the ſame practice.

The effect of frequent tillage is to make the pores numerous and ſmall; they cannot be too numerous, or too ſmall, and therefore the more tillage is allowed, the better. Theſe pores cannot be too ſmall, when made by tillage, becauſe the reſt of the earth being light and looſe, the roots of the tendereſt and fineſt kinds will make their way; whereas in untilled earth, they may eaſily be too ſmall, becauſe the earth all about them is hard.

To keep a piece of ground in heart by tillage alone, that ſhould be done frequently and well.

The firſt plowing in the uſual way anſwers very little purpoſe, nor does the ſecond do much more good. Theſe, if done with common plows, and in the common manner, cannot ſo properly be ſaid to be tillage, as to prepare the land for tillage: the third and fourth plowings are done at leſs expence than theſe, and they are of much greater benefit: every plowing that is given after theſe, does more ſervice, and comes at leſs expence. This is ſufficient to recommend the practice to the farmer; and the effect is certain. We ſee nothing prepares land for wheat in the common way but frequent plowings: and when they come thus eaſy, why will not the farmer give more of them to his wheat land, that his crop may thrive the better; and give them alſo in proper quantity to his lands that are prepared for any other ſeed: they will return the labour with ten-fold increaſe.

When a land has been put into good condition by manure, nothing aſſiſts the effect ſo much as frequent tillage; a piece of ground prepared with dung, will be exhauſted in three years; but let it have double tillage, which is an expence nothing near the price of a new dunging, and it will keep in heart ſix years; and with more labour longer.

There is no way of managing land to the beſt advantage, but by the uſe of both. Manure ſhould be called in when the ground has been long kept in heart only by tillage; and tillage, in this increaſed degree, ſhould be us'd to preſerve and continue the effects of manure. Nothing is ſo idle as the propoſing one againſt the other: there is no reaſon the farmer ſhould not uſe both, for they never interfere with each other. We have ſhewn him before the nature of ſoils, the virtues of manures, and now the benefits of repeated tillage, ſo that he will be able to call in one or other alone, or both jointly, as he ſhall find moſt beneficial.

As to the keeping a land in heart by tillage, it is only to be done by allowing it a ſufficient quantity of labour: the more the better; there being proper intervals of reſt between. A piece of ground may be thus not only kept in heart, but made ſtronger and better; for the finer land is made by tillage, the richer it will become; the more plants it will ſupport, and the better it will maintain them.

CHAP. XXI.

Of the nature of the improvement by tillage.

THE finer an earth is made by tillage, the more it is enriched by dews, rain and air. Theſe penetrate into every part of a well tilled piece of ground, ſo that when it comes to be turned again, and freſh broken, all is rich and full of nouriſhment. This is not the caſe in tough and hard lands; the dews and rains do not penetrate them.

In very dry and light lands, the inſtruments of huſbandry cannot take full effect, for their particles give way to the plow without dividing, and at the utmoſt are only turned. The author of the horſehoeing huſbandry is aware of this; and he declares, ſuch lands do not deſerve the name of arable, but ſhould be reputed deſart, ſcarce deſerving the name of land, except by way of diſtinguiſhing them from ſea.

Were there no other huſbandry in the world but the horſehoeing kind, this would be true; and the farmer who happened to have ſuch ground in his hands, muſt leave it uncultivated. But this may ſhew the inſufficiency of that author's ſcheme of making the horſehoeing huſbandry univerſal, even from his own confeſſion.

We have ſhewn how ſuch land, as he ſays ought not to be called arable, may by another method of huſbandry be improved ſo as to yield large crops: and by ſuch management as we have directed for barren ſandy lands, the very deſarts of Libya might yield excellent crops of corn.

Clay added to a ſandy ground, reduces it to loam, and loam is fertile: furzes may be raized for a fence. In ſuch an incloſure, corn will grow, therefore this new ſcheme is not univerſal. It will aſſiſt the old methods of huſbandry, but it will not ſupply their place.

We ſee in this laſt inſtance, the land cannot be brought into heart by tillage alone, even upon his own confeſſion; this ſort of land then muſt be managed upon the principles of the old huſbandry; that is, by clay, and the proper manures: but it may be kept in heart by tillage.

The method propoſed by Mr. Tull, has great advantages, tho' it will not ſucceed alone. This land will be better kept in heart by his kind of tillage, than by the old, becauſe his is the more perfect. The ſoil is made leſs fine in common tillage, therefore the advantage will be leſs; in that he directs it will be more fine, and conſequently, the effect will be greater.

We cannot ſee a greater inſtance of the effect of huſbandry any way, than on ſuch a piece of land as this. The farmer upon the principles of the old huſbandry, adds clay to it, and by this means converting it into loam, he may be ſaid to make a ſoil. It is then in the condition of one that is better by nature, and is fitted for new improvement by a more perfect tillage. It could not receive the advantage of that method according to the confeſſion of its author in its natural ſtate; but it may in this improved condition. We ſee therefore how uſeful it is to the farmer to know every practice; not to ſtick to any one, but to employ them all as there may be occaſion. 'Tis thus we propoſe them to him for his general uſe. He ſees in this inſtance he may make a ſoil by the old methods, and he may keep it in heart by the new; ſo that the one ſhall continue to him thoſe advantages he received from the other.

The two great articles in providing plants ſhall have nouriſhment, are, that the roots may ſpread freely to their full extent, and every where have the due preſſure of the ground. Theſe are effected excellently by tillage in a compleat way, for the earth is made fine and ſoft: it lets them in any where, and it cloſes in every part about them. All the earth is full of nouriſhment for plants, and their roots are thus put into a condition to ſearch for it, and receive it. If they could not ſpread by reaſon of the hardneſs of the ground, they muſt be content with what is ſupplied by the earth juſt about them; and if they ſpread ever ſo freely, and paſs where there is ever ſo much nouriſhment, they cannot get it unleſs they come to touch the ſurfaces whereon it lies; this they cannot do in half-tilled ground becauſe the cavities are there ſo large, that the ſmall roots paſs through them without touching their ſides. We repeat this that the farmer may perfectly underſtand and remember it; for this is the principle on which he is to act in the new method of tillage.

Let him never ſpare tillage: the land being poor is no argument againſt it: for the poorer the eaſier it is wrought; ſo that there is leſs expence in the tillage; and if the crop be not equal to that upon better land, neither is the rent.

The great miſtake of the Engliſh farmers, is not giving their land ſufficient breaking; and in this they err very unhappily,

happily, for they go through the laborious and expenſive part, which is that of the firſt plowings; and leave off juſt when the remainder is moſt wanted, and would be moſt eaſy.

They ſuppoſe the ſoil to be fine enough when the harrow will cover the ſeed: as if the covering of that were the only uſe of the fineneſs of land. To give the crop the full benefit of the land, every lump ſhould be broke; for tho' the ſeed may be buried among theſe, and covered in an irregular manner, the roots which ſhoot from it will never be able to penetrate thoſe lumps; and they are of no ſervice to its vegetation; whereas if the tillage had been continued till theſe lumps were broken, every particle of the ſoil would have been made uſeful; and the crop would have had the advantage of double, treble, or ſometimes much more land in the ſame field.

The harrow is an inſtrument that often miſleads the farmer to his hurt. He ſuppoſes he can tear the ſoil to pieces with it; whereas, on the contrary, the horſes that draw it often do more harm by their treading, than the harrow does good. Let him never depend upon this inſtrument for breaking the ground; let him uſe it ſparingly and cautiouſly, and then it will be of ſervice: but better things may become hurtful by improper management.

The roller is another implement that often does harm, though it may do a great deal of good when properly uſed. The ſeaſon is of great importance. The buſineſs of tillage is to break the land, and divide its parts; this may be aſſiſted by the roller, if uſed at a proper ſeaſon, otherwiſe it may be impaired by it. If the roller be brought on in wet weather, it preſſes down and cloſes the ſoil; but if uſed only in dry ſeaſons, it breaks the lumps, and does a great deal of good.

If the harrow be uſed firſt to tear up the clods, then the roller to break them, and the ground be afterwards plowed again; and all this in dry weather, no kind of tillage anſwers better.

BOOK VI. PART III.

Of the Inſtruments of Huſbandry, and their ſeveral uſes.

CHAP. XXII.

Of plowing.

WE have explained the principles on which tillage is founded, and the means on which its ſucceſs will depend. This may be called the theory; from which we now come to the practice. Nor would that theory have been allowed ſo much room, but that the practice depends for its ſucceſs entirely on the underſtanding it.

The management of graſs grounds is comprized in a ſmall compaſs; and the expence and hazard are little. But the management of arable land is the height of the farmers buſineſs. It requires the moſt knowledge, and it demands the moſt expence, therefore he ſhould endeavour by all means to make himſelf a maſter of it. The profits ariſing from this branch, are much greater than from any other; but if he ſets about it ignorantly, the loſs will be great, and his ruin may be the conſequence.

All ſoils are not to be wrought in one manner: if they were, the knowledge of huſbandry would be eaſy. But as each has its particular manures, ſo it requires a particular and appropriated manner of tillage. Plowing is the capital operation of huſbandry, and according to theſe differences of ſoils, and the particular treatment they require, there have been invented different ſorts of plows: theſe are ſeverally uſed according to the nature of the ground, and ſhall be deſcribed in the ſucceeding chapters.

There is great difference between a tough clay, and a looſe ſand: one of theſe ſoils requires one and another kind of plow, and of plowing; neither would any uſe the ſame inſtrument to till a deep ſoil, and one where there is at five or ſix inches depth a bed of ſtone. There is often a bed of barren earthy matter alſo at this ſlight depth, which is not to be brought up with the ſoil. Theſe demand their different manners of plowing; and in order to its being rightly done, the farmer is to ſee there be a proper inſtrument, and to follow the work with his eye, that it be rightly uſed: that the beſt part of the ſoil be not left untouched where it lies deep; nor the barren part raiſed up where that lies ſhallow.

Theſe light and ſhallow ſoils work eaſily, and coſt little in tillage; but they are often ſo poor, that they require a large expence for manures. Tillage alone, as we have ſaid, will make almoſt any land bear crops; but manure is to be added to theſe, that the crops may be great.

On the other hand the firm and tougher ſoils depend more upon tillage than manure. Plowing comes dear in theſe, but the expence in the other article is ſo much leſſened.

All that has been hitherto ſaid of plowing, regards the time before ſowing the land; but we are to mention alſo under that head, another ſpecies of tillage, which is performed after the plants appear: this is, properly ſpeaking, not plowing, but hoeing; though, according to the new method of performing it, by a kind of plow, and with the aſſiſtance of horſes, it has got the name of plowing. This is the kind of tillage called horſehoeing huſbandry: it has its foundation upon very rational principles; and its ſucceſs anſwers accordingly: but there is a backwardneſs of bringing it into uſe, which ſeems to ariſe principally from its novelty. In other countries where they are more ready than we to try experiments, it is got into uſe, with great advantage. We hope to ſee it ſoon introduced in the proper ſoils, and under proper circumſtances, here.

CHAP. XXIII.

Of the form of the antient plow.

WE may ſee by the plow, that the moſt uſeful things are neglected, if common; and thoſe who have it in their power to be of greateſt ſervice to the world by improving, leaſt regard them. There is no author of any note who has written on the ſtructure and uſeful variations of this inſtrument: nor have men of genius or knowledge concerned themſelves in its fabrick. Plows were invented in the rudeſt times; and, till very lately, they have had little improvement. What has been done, by ſome few ingenious perſons within theſe few years, ſhews what is practicable; and we hope will lead others to the ſame uſeful purſuit.

The firſt tillage was probably with the ſpade, and were that as convenient for large quantities of ground, as it is uſeful where it can be properly employed, no inſtrument could be compared with it. But when whole fields came to be tilled, it was natural to deviſe ſome method of ſaving the labour of men; and, conſequently, the plow was invented.

As this was more frequently uſed, its form became altered, but improvements have been in nothing ſo ſlow: and this inſtrument of ſuch univerſal uſe, and ſo vaſt advantage and importance to mankind, is ſtill capable of many more; and ſtill wants them.

All tillage has its advantage from dividing the earth. The ſpade, as it is wrought by hand, does this moſt perfectly; and for this reaſon gardens are more fertile than fields: but it may not be impoſſible now we know in what the perfection of tillage conſiſts, to make the plow equal its effect.

The advantage of the ſpade is, that it goes deeper, and divides the land into more particles: but the plow, when its ſtructure ſhall be fully perfected, is capable of all this. The four coultered plow is an excellent contrivance, and ſhews there is nothing impracticable in the thought of forming one that ſhall go deeper, and divide the earth more than the ſpade.

The antient plow had no coulter, nor earth board: the ſhare always going obliquely, ſerved as an earth board; and the two ears which were the corners of a piece of wood lying under the ſhare, did the office of ground wreſts.

This ſort of plow is uſed in Italy, and even in ſome parts of France at this time. It ſerves for the turning up of light land, but it would do nothing with our ſtiff and tough ſoils.

This appears to have been the original plow, and it is a very plain and ſimple contrivance. It did the office for which it was made in the place where it was invented; but it was not fit for other lands, and other countries; and therefore it was altered in them.

In thoſe parts of Italy where the ſoil is ſoft and mellow, this inſtrument does very well to keep it in tillage; but even in thoſe favourable lands it is unfit for the bringing them into that condition: for when they have lain in graſs, it is difficult to manage them with it. They are obliged to go two or three times over the land before the turf is broken.

Theſe plows, for want of a coulter to cut the turf, tear it to pieces with great awkwardneſs and difficulty, but when that is once cut through, the ſoil being ſoft and tender, they eaſily get deeper.

As our ſoil is different, our plows are made in another manner, for otherwiſe they could not cut it. The neceſſity of a coulter is plain, becauſe of the thickneſs to be cut, and that neceſſity was doubtleſs the mother of the invention. Our plows, when well made, cut off the furrow at the bottom flatwiſe, and therefore it is as thick on the land ſide as on the furrow ſide; but the plow cannot break it off from the whole land at ſuch a thickneſs, ſo that there muſt be a coulter to cut it. By this means the furrow is turned perfectly whole, and no part of the turf broken. Hence if it lie long without new turning, the graſs from the edges will ſpread, and form a new turf on the other ſide, which was the bottom of the furrow, but is now the ſurface of the earth.

If the land be left thus, it will ſoon be greener than it was before plowing, and the graſs ſpreading its roots, will bind it firmly together; ſo that there will require a great deal of time and labour to bring it into a condition for ſervice.

This has ſhewn the inſufficiency of the common plow, and from a ſenſe of this, has ariſen the invention of the four coultered kind. Several others have been deviſed to anſwer the ſame purpoſe, but none ſucceed ſo well.

CHAP. XXIV.

Of the ſeveral kinds of plows in common uſe in England.

OUR common plow differs very much in ſhape and form in various places; according to the fancy of the people, and the nature of the ground. Some have longer and ſome ſhorter beams; and there are great varieties in the length and form of the ſhare, the coulter, and the handles.

Without regarding the cuſtoms of particular places, there is great reaſon to have reſpect to the nature of the ſoil. The plow for ſtiff clay ſhould be long, large, and broad, with a deep head, and ſquare earth board, ſo that it may turn up a large furrow. The coulter ſhould be long, and very little bending, with a very large wing; and the foot long and broad, ſo as to make a deep furrow.

The plow for moderate ſoils ſhould be ſmaller than the former, but broad at the breech: the coulter ſhould be long and more bending, and the ſhare narrow, with a wing coming up to arm and defend the earth board from wearing.

The plow for light ſoils, ſhould be lighter and ſmaller than any of theſe: the coulter ſhould be more circular and thinner, and the wing not ſo large.

This will give the farmer the general rule for his conduct: let him conſider his ſoils under theſe three heads of heavy, moderate, and light, and in this general manner ſuit the bulk and fabrick of this inſtrument to them.

Plows are ſometimes made with wheels, and ſometimes without, but in general the wheels are a great advantage. There are circumſtances in which they are troubleſome, and therefore it is fit they ſhould be in ſome plows omitted.

That which might be eſteemed the firſt great improvement in England, is the wheel plow, which from the place where it was firſt us'd has been long call'd the Hertfordſhire plow. This conſiſts of a beam and handle, a neck, an earth board, a ſheath, a ſhare, and a coulter, with the pin, pillow, and wheels. Theſe are parts exceeding familiar to the farmer, but for the ſake of thoſe, who may not be acquainted with the practical part of huſbandry, they will be explained in the figures; in which we ſhall alſo ſhew how this plow is form'd, as improved at preſent.

This common wheel plow, as uſually made, is very ſtrong, and is ſerviceable for moſt uſes. It is eaſily managed, it follows the horſe lightly, and it ſuits almoſt every kind of land. The greateſt exception to its uſe is in miry clays in winter; becauſe the wheels cut into them, and clog and ſtick when they are work'd at that time of the year. This is fit for that ſort of ground when ſummer fallows are to be plow'd, and when a graſs ground is to be firſt wrought for arable, for it turns the turf well, and is very fit for uneven ground, and for the drieſt ſummer weather. Some make this plow in the original manner, with the handle ſloping on one ſide, but this renders it troubleſome to hold, or to follow; the remedy was eaſy, and people not bigotted to cuſtoms, have improved it greatly by making that part ſtrait.

This is in a manner the general plow at this time, and it is this varied more or leſs, but never much, according to the pleaſure of the owner, or faſhion of the place, that we ſhall always mean when we ſay the common plow.

The Eſſex plow, (for the beſt way to diſtinguiſh theſe inſtruments is according to the places where they are uſed) has its earth board, if the expreſſion may be allowed, made of iron: they make it rounding, and this has a great advantage in the turning the turf, they generally make it light, and the wheels proportioned. It is fit for light ſoils, and rids a great deal of buſineſs. We do not mean by calling this the Eſſex plow, that they uſe no other in that county; but that is the place where this kind is moſt uſed.

The Lincolnſhire plow owes its form to the general nature of the ſoil in that county. The fen land there is light, ſoft, and mellow, free from ſtones, and naturally over-grown with weeds and ſedge on the ſurface: for this they uſe a plow with a circular turning coulter, and a large ſharp ſhare, this is often a foot broad, and quite ſharp at the edge. This plow has no wheels. There is a foot at the fore part of the beam, which they ſet higher or lower with a wedge, and by that means keep the fore part from going deeper than they chuſe. They have alſo wedges for ſetting the hinder part where the handle joins the beam. The coulter ſtands in its uſual place, before the ſhare, and is a round iron wheel, with a ſharp edge. This turns upon an axle as the plow moves, and cuts through the roots of the ſedge or graſs as it goes round, while the broad ſhare cuts the bottom. This would not do on other land; but where the ſoil is of a free and fine kind, and is thus cover'd with a tough and tangled matting of roots, it anſwers the purpoſe excellently.

The dray or drag plow was at one time, in a manner, univerſal, and there is no particular place where it can be ſaid to be moſt in uſe now. It is retained in ſome, and rejected in others, according to the ſenſe and ſpirit of the farmer in adopting improvements. This is a very plain and ſimple kind; but notwithſtanding the advantage the others have over it, on many occaſions, it excels them all for wet clays in the winter plowings; for having the leaſt workmanſhip of any, it is the leaſt apt to clog, and having the feweſt parts is fitteſt for ſuch ground, where nothing is requir'd but going on, and turning up. On other ſoils, and at other ſeaſons, it is much inferior to the other kind. This plow has no wheels: it conſiſts of a beam, handle, earth-board, and ſhare, and is ſet higher or lower, as they find occaſion, by wedges at the ſheath.

In Suſſex they have a plow with one wheel: this is a very ill contrived, and inconvenient inſtrument. 'Tis broad in the breech, and therefore draws heavily. It is growing out of uſe there: and of all the plows that have been invented, is the leaſt worth introducing any where elſe.

The largeſt kind of plow, is that which in ſome parts of the county of Cambridge, they uſe for cutting of drains. It is of the ſhape of the common plow, and has no wheels: it is very bulky in all its parts, and has two coulters: one of theſe is fixed in the beam as uſual, and the other in a piece of wood, faſtened to the beam for that purpoſe; theſe both turn inwards, and cut each ſide of the trench. The ſhare is broad and flat, and cuts the bottom of the trench. The earth board is three times as long as in other plows, and caſts the mould a great way off the trench. This inſtrument cuts a trench a foot and half wide at the top, a foot at the bottom, and a foot deep. It is excellent for this purpoſe on wet lands, ſaving a great deal of expence in the common way of digging trenches by hand, but it requires a number of horſes to draw it. There is ſomething in the contrivance of this plow, that may be uſeful farther than in the making of trenches, and it is for that reaſon propoſed here to the farmer's conſideration.

CHAP. XXV.

Of the uſes of the common plows, and their proper make.

WHERE there is a hard ſoil; or where the land is full of flints, ſharp ſtones, and gravel, no plow does ſo well as the two wheel'd kind: this may be ſuited to the occaſion, with reſpect to ſtrength; and where ſtrong clays are to be wrought in ſummer fallows, no other is equal to it. The point of the common plow will fly out at every ſtep on theſe occaſions, but this will anſwer very well when the earth is ſo hardened, that no other will penetrate. The wheels of this plow ſhould be about twenty inches in diameter, and it will always run beſt if the furrow wheel be made a little larger than the other.

A great advantage of this kind is, that it will work upon uneven ground without levelling, ſo that none is equal to it for the plowing up of paſtures where there are mole hills. Theſe diſturb the other plow extreamly, but this goes through all.

Though the ſingle wheel plow of Suſſex be ſo clumſy an implement, there is no reaſon why the uſe of a plow with one wheel ſhould be rejected. A light and ſlender kind may be furniſhed with one wheel inſtead of two, and will anſwer

ſwer excellently on light ſandy ſoils. It will not be fit for harder work; but running eaſily it will ſerve this purpoſe better than any other.

The common two wheel'd plow is to be drawn with horſes or oxen two a-breaſt. The heavy plow without wheels, which is uſeful for wet clays, and other diſagreeable work, is to be drawn by three, four, or five horſes in length. The great uſe of this is where the ground lies level, and where there are no obſtructions of roots, for theſe greatly diſturb its operation. The two wheel plow is preferable in ſuch caſes, notwithſtanding all its inconveniences.

Whichever of theſe plows the huſbandman chuſes, let him take care in the make of it, that it be ſuited to the ſoil. Let it be made larger if for deep or ſtrong ſoils; and lighter and ſmaller if for ſhallow ones. When the land is ſtiff and deep let the coulter be long and ſtrong; in the deepeſt ſoils the coulter muſt go fartheſt, becauſe the weeds root deepeſt there.

Of whatever form or ſtrength it be, let him ſee that the iron work be made true as well as ſound.

As ſo much depends upon the iron work, it is beſt to have that made firſt, and the wood work wrought to it: for in the common way of making the iron to the wood the ſmith is often forc'd to work wrong in order to ſuit it: and then no art will make the plow go well. Let him take care the iron work be wrought ſmooth, and rightly temper'd; and let it be kept bright and clean in the uſing.

The ſhorter and leſs the plow, the eaſier it is worked; but though this be a recommendation in light ſoils, there is no uſing ſuch as have not a due weight and ſtrength in tough and heavy work.

CHAP. XXVI.

Of the improvements of the common plow.

THE regard ſhewn to huſbandry of late years, has occaſioned ſome amendment of the plow, for particular purpoſes, and ſeveral forms have been invented, ſome rather fanciful than advantageous, others uſeful.

A double plow invented ſome years ago, is at this time in uſe in ſome places, by which twice the quantity of land is plowed at a time, one furrow by the ſide of another. As this requires twice the number of horſes and of men, the expence is nearly equal to the advantage: but it is a hint capable of improvement, for although in tough and deep ſoils it loſes the benefit, from the neceſſity of a double expence, yet certainly in ſome of thoſe light and ſhallow lands we have in Buckinghamſhire, and other places, a double plow might be ſo contriv'd, as to be drawn by two horſes, and managed by one man; and then the advantage would be double, and the expence the ſame. This has not been put in practice yet, but from what I have ſeen, I am very certain it is practicable.

There has alſo been a contrivance of a plow that turned up two furrows at once one under another. This I have ſeen uſed, but it is ſo unwieldy, and difficult of draught, that in the preſent form it will never get into reputation; but we have ſeen what would be the advantage of plowing deeper than ordinary, and that is enough to ſpirit up ſome who underſtand more of the mechanic arts to contrive one upon the ſame plan with more judgment. Doubtleſs it is poſſible to obtain this advantage with leſs trouble than attends it in the plow that has hitherto been contrived for that purpoſe.

Digging with the ſpade is a finer and more excellent tillage than that by the plow; and that is the reaſon gardens are more fertile than fields of the ſame ſoil, and with the ſame manure. That the ſpade digs deeper, and breaks the particles of earth finer. A plow conſtructed upon this plan, with judgment, would have both thoſe advantages: it would dig as deep as the ſpade, and might be made to break the earth as much. It is ſurely worth the while of thoſe who have a knowledge in the proper arts, to devote ſome of their ſtudies to this improvement. The adding breadth to the fin of the drag or foot plow, will make it more ſerviceable in damp and ſtiff clayey lands; and in plowing theſe the horſes ſhould always go at length, that they may tread leſs of the ground. On the other hand, in light ſoils, the cattle ſhould go a-breaſt, for the double treading is ſerviceable to ſuch ſoils. In ſtony ground with graſs of ſome ſtanding, the plow ſhould have a round pointed ſhare, with a fin to cut the roots.

In ground that has been wood, or in other places where there are large roots in the way, it is a good method they uſe in ſome parts of Staffordſhire, of having an inſtrument of iron with a ſharp edge, let through the beam of the plow, behind the coulter, and through the plow-head. This while it arms the plow for cutting theſe roots, ſtrengthens the whole, and makes it able to bear the rough work, which elſe would tear it to pieces: in other places they uſe a couple of ſharp wings of iron made faſt to the plow-ſhare, which anſwer the ſame purpoſe, but this does not ſo ſtrengthen the plow. Dr. Plot, in his hiſtory of that county, deſcribes theſe; they are in uſe ſtill, but not generally. Theſe may all give uſeful hints, for there is not one of them but has its uſe, nor one that may not be greatly improv'd.

Theſe improvements rather ſhew what may be done, than execute it well in themſelves; they may be conſidered as attempts to what is proper, rather than as compleat things: there remains one to be ſpoken of in which the improvement is very great, and is carried to a due degree of perfection: this is the four coulter'd plow, ſo highly and ſo juſtly extolled by the author of horſehoeing huſbandry.

CHAP. XXVII.

Of the wheel plow.

THE foundation of this inſtrument is the two wheel'd plow, in its moſt improved condition: it differs in having three additional coulters. We ſhall firſt conſider this wheel plow in its improved ſtate; and afterwards the four coulter'd plow formed upon it. This conſiſts of two parts, diſtinguiſh'd by the names of the plow-head and plow-tail. The head has two wheels of about eighteen inches diameter: the ſpindle or axis of theſe is of iron, and paſſes through a box which ſtands croſswiſe of the beam. This ſpindle turns round both in the box and in the wheels. From the box riſe two perpendicular ſtaves, called crow ſtaves: theſe are faſtened into the box, and have each two rows of holes, by means of which the beam is raiſed or ſunk, in order to increaſe or diminiſh the depth of the furrow. This is done by pinning higher or lower a croſs piece, called the pillow, becauſe the plow beam reſts upon it. At the top of the two crow ſtaves is another croſs piece, called the gallows. The crow ſtaves paſs through this by mortiſes, and are pinned into it. From the box of the plow within the ſtaves, there is carried a ſmall frame compoſed of two legs, and a croſs top, to which the links of iron are fixed whereby the plow is drawn: this frame is called the wilds of the plow. In the middle of the box there alſo is a hole into which is let one end of an iron chain, the other end whereof is faſtened to the middle of the beam, this is called the tow chain, and faſtens the head and tail of the plow together: at the end where it reaches the beam, this has a collar that goes round it, and is faſten'd by a ſtake within ſide the box. This ſtake is held up to the left crow-ſtaff by a wyth, which paſſes round it above, and under the end of the gallows below: a piece of cord is ſometimes uſed inſtead of a wyth: any thing that may be tied will do. From the top of this ſtake goes an iron chain, called the bridle chain; this is faſten'd at one end to the top of the ſtake, and at the other to the middle of the beam of the plow, by a pin in the ſame place where the collar of the tow chain paſſes round it.

This is the ſtructure of the head of the plow, and theſe are its parts.

The tail conſiſts of the beam, which is a ſtout and long pole; through which, a little below the pin that holds the bridle chain, and the collar of the tow chain, there paſſes the coulter, a long and ſlender iron inſtrument, which running downward and a little forward, ends near the point of the ſhare. The coulter is fixed in its hole of the beam by a wedge, ſo that it can be raiſed or ſunk at pleaſure: behind are two handles, one longer and the other ſhorter; the ſhorter of which meets the head of the fore ſheat, where it enters the beam, and is fix'd by a pin, and faſten'd to the top of the hinder ſheet by another pin. Theſe ſheets are two boards, the hinder one near the extremity of the beam; the other forwarder and more ſlanting; and are both faſten'd to the ſhare, which runs flat below. On the other ſide of the plow tail deſcends another flat board, call'd the drock; to this the groundwriſt is faſtened, which is a board running nearly parallel with the ſhare. The longer of the two handles is alſo faſten'd to the drock, and the earth board riſes at its bottom. The fore ſheet is ſupported by a double retch, which paſſes through the beam, and is faſten'd by ſcrews and nuts.

This is the four wheel plow as uſed at preſent where agriculture is moſt underſtood, and beſt practiſed: it conſiſts of more parts than the two wheeled plow of Hertfordſhire, according to the firſt invention, but there is not one of theſe but is an advantage in either ſtrength or convenience.

CHAP. XXVIII.

Of the four coultered plow.

WE have ſeen the two wheeled plow formed upon the beſt model, and in the moſt artful manner that has been yet deviſed for it. And we are now to give an account of that great improvement upon the four coultered plow. This, as it adds parts of the utmoſt uſe, may be conſider'd as a diſtinct inſtrument, its three additional coulters giving it a power of breaking the land beyond any other that ever has been invented.

The reader, who is acquainted with the ſtructure of the two wheel'd plow, will find no difficulty in comprehending this.

The beam of the common two wheel plow, is uſually eight foot long; the proper length of the beam of the four coulter'd plow, is ten feet four inches. That of the common kind is ſtrait all the way, but that of the four coulter'd plow riſes with a bend when it comes toward the wheels, to where it reſts upon the pillow. The beam, ſuppoſing the plow to ſtand upon a level ſurface, would be at the end of the tail only eleven inches and a half from the ground: at the place where the bend begins, which is a little before the firſt coulter, it wiil be one foot eight inches and a half; and where the beam bears upon the pillow, two foot ten inches.

The four coulters are thus diſpoſed. Meaſuring from the tail or extream end of the beam behind to the back of the firſt coulter, is three foot two inches; this has its point near the ſhare. From the back of the firſt, to the back of the next coulter, is thirteen inches, from thence to the third thirteen inches, and from thence to the fourth the ſame. So that from the end of the beam behind, to the place where it begins to bend upwards, which is a little before the fourth coulter, counting from the tail, is ſeven foot. The length of the additional coulters, particularly of the fourth, next the head of the plow, would be a great inconvenience in this machine, but this is prevented by the bending of the beam toward the head. If the beam were ſtrait as in other plows, theſe coulters muſt be very long to reach the ground, and they will require to be extreamly ſtrong not to bend: this would make them expenſive and cumberſome; and at the ſame time their length, if ever ſo well form'd, would make them apt to looſen the wedges wherewith they are fix'd in the holes. This would make the coulter riſe up out of its work: but by the contrivance of a crooked beam, a moderate length in the coulters ſerves; they do not require any great thickneſs or quantity of iron, and they always work with regularity.

The beam may be made of aſh or oak, according to the nature of the ground whereon it is to be employed; for aſh has the advantage of being light, but the oak is vaſtly ſtronger: when the work will be very hard, the oak in ſpite of its weight, is preferable. As to its breadth and thickneſs, they may alſo vary according to the ſoil that is to be tilled; but for moderate ground, the beam at the firſt coulter hole ſhould be five inches deep and four broad.

Giving this as a middling proportion, the ſize of the other parts may be as follows. The fore ſheat, commonly called ſimply the ſheat, ſhould be ſeven inches broad; the retch upon it muſt be of iron, and its left leg muſt ſtand foremoſt, that the edge of its forepart which is flat, may fit cloſe to the wood of the ſheat. The uſe of this reach is to hold the ſheet up to the beam, by means of nuts and ſcrews. Through the top part of the ſheat there is alſo to be a hole, which is to be a ſmall part within the beam, ſo that a pin being driven into the hole, draws up the ſheat very cloſe. The elevation of this ſheat is a great article in the management of every wheel plow. If this make an angle of more than five and forty degrees, with the plain ſurface whereon the plow ſtands, that inſtrument will never go well. In the four coulter plow it ought to make an angle of forty-two or forty-three degrees only.

This will be very well underſtood by thoſe who are uſed to mechanics; but for the ſake of the common farmer, we ſhall ſay all that is meant by it is, that the ſheat is to be a little leſs raiſed in this than it is in a well going common wheel plow.

The length of the ſhare from the point to the tail, ſhould be three foot nine inches. The fin of the ſhare riſing ſlanting from the point upwards. The point of the ſhare ſhould be three inches and a half long; it ſhould be flat underneath, and round at the top, and this ſhould be of hard ſteel underneath. The edges of the fin alſo ſhould be well ſteeled, and its length proportioned to the nature of the ground.

Behind the fin is placed the ſocket, into which the bottom of the ſheat enters; and from the tail of the ſhare is to riſe a ſmall plate of iron: this is to be well rivetted to the ſhare. By this the tail of the ſhare is faſtened to the hinder ſheat. This faſtening is done by an iron pin with a ſcrew at the end, to which a nut is to be ſcrewed on the inner ſide of the ſheat.

The ſocket is to be a mortiſe of about a foot long, at the upper part two inches deep; and the fore end muſt not be perpendicular, but ſlanting, conformable to the fore part of the ſheat. The upper edge of the fore part of the mortiſe muſt bear againſt the ſheat; and if it be not quite ſo ſlanting as the ſheat, a little of the wood is to be pared off at the edge to make it fit.

The upper ſide of the ſhare ſhould be perfectly ſtrait, but its neck on the under ſide ſhould ſtand a little hollow. This hollowneſs ſhould be about half an inch in a common plow, but in the four coulter'd plow it ſhould not be above a quarter of an inch: ſo that the ſhare, when it is firſt made ſtanding upon its bottom, bears upon the level ſurface only in three places; the point, the tail, and the corner of the fin. The hollowneſs of the fin muſt be greater for a ſtony ſoil than others.

The placing the ſhare rightly upon the ſheat, is the moſt important and moſt difficult part of the plowright's trade: on this depends the well going of the plow; and for this reaſon, as it is more important in the four coulter'd plow than in any other, we adviſe the farmer when he has made himſelf a maſter by theſe figures and deſcriptions of the form and ſtructure of this plow, to take care that he employ a ſkilful and an honeſt workman: and if he do not find the plow go well when made, to look there for the occaſion of the fault, for in that part is generally the ſeat of it.

The groundwriſt is to be of iron, its length muſt be two foot five inches, its breadth at the longeſt end four inches, and it is to go ſomewhat ſmaller all the way. Its thickneſs in general is to be three eighths of an inch; but at the ſmaller end it is to be much thinner, that it may be capable of bending ſo, that it can be brought cloſe to the ſhare.

At the ſmaller end of the groundwriſt are to be four holes, through one of which there goes a nail that faſtens the groundwriſt to the ſheat. This paſſes through a long hole which is made in the ſide of the ſocket of the ſhare. The ſpace between the outſide of the groundwriſt, to the outſide of the ſhare, is eleven inches and a half, and this is the width of the lower part of the plow-tail at the ground. At the upper ſide of the broad end of the groundwriſt there are alſo ſeveral holes, by which it is nail'd to the lower part of the drock, this is long and narrow, and has three holes for the reception of its faſtenings.

The earth board has a riſing near its end, which takes hold of the end of the ſheat to faſten it the more firmly; and near that are two holes by which it is fix'd to the ſheat: at the other end alſo there is a hole by which it is faſten'd to the drock.

The pin which faſtens the earth board to the drock, is to be thicker in the middle than at the end, and this prevents the earth board from coming near the drock. By means of this pin the earth board is alſo ſet at a greater or ſmaller diſtance from the drock, as there is occaſion ſometimes to throw off the furrow farther from the plow than at others. It always ſtands a good deal farther out on the right hand than the groundwriſt, and this is one reaſon why the drock is made crooked; bending outwards in that part.

The long handle of the plow is to be five foot four inches in length, and four inches broad in the wideſt part. It is to have holes in its lower part for pinning it to the ſheat, and another near its upper end by which it is faſten'd to the drock.

The length of the ſhort handle is to be three foot nine inches, and it is to have two holes, both toward its lower end: by the upper hole it is pinned to the hinder ſheat, and by the lower to the top of the fore ſheat above the beam.

We come now to deſcribe the placing of the four coulters in the beam, contriv'd for their reception; this is the moſt important article of all: the greateſt point to be obtain'd is, that the four imaginary planes, deſcribed by the edges of the four coulters, as the plow moves forwards, be all parallel or nearly ſo, for if this be not regarded, they will not enter the ground together.

To make ſure of this important point, the holes for the coulters muſt be made in the beam in the following manner. The firſt coulter is to be placed as already directed, the ſecond coulter hole is to be made two inches and a half more on the right hand than the firſt: the third two inches and a half more on the right hand than the ſecond; and the fourth two inches and a half more on the right hand than the third. This will place the four coulters conformable to the four cuts they are to make in a ten inch furrow.

No beam of a plow is broad enough to hold theſe holes in this direction; and for that reaſon a piece of wood is added to the beam of the four coultered plow to give ſpace for it. This piece is to be very well faſtened to the beam: the ſecond hole is to be made, as will be ſeen, according to the diſtance, partly in the piece, and partly in the beam; and the others will be all made entirely in the piece. The piece is beſt faſtened by three good ſcrews with their nuts, and its place is on the right ſide of the beam. The diſtance of each hole to the right of the laſt, muſt be meaſured from the middle of one hole to the middle of the other.

The fore part of every hole muſt incline a little to the left, ſo that the backs of the coulters may not bear againſt the left ſide of the inciſions made by the edges. Each hole is to be a mortiſe of an inch and quarter wide, with its two oppoſite ſides parallel from top to bottom. The length at the top is three inches and a half, and at the bottom three inches: and the back of each is not perpendicular but ſlanting, and makes the coulter ſtand ſlanting. It is fixed in this mortiſe by a wedge in the ſame manner as the coulter is in other plows.

The coulter is a kind of iron knife, conſiſting of a handle and blade; the latter having an edge. The length of the coulter is to be two foot eight inches, but it will ſhorten in wearing; the blade is to be ſixteen inches long, with its edge running all the way; the handle is to be of the ſame length. This is ſo long that it will at firſt very well ſtand up above the beam, but it muſt be driven down lower and lower, as the point ſhortens by wearing. The handle is to be an inch and ſeven-eighths broad and ſeven-eighths of an inch thick throughout.

The firſt coulter in all plows ſhould be ſo placed, that its back ſhould bear againſt the back of the hole; its right ſide above to bear againſt the upper edge of the hole, and its left ſide to bear againſt the lower edge: and for this reaſon there always are required at leſt three wedges to hold a coulter in its place. The pole wedge ſtands before it, the other two, one on the left ſide above, and the other on the right ſide underneath: and the hole muſt be ſo made, that the coulter ſtanding thus acroſs, its point may incline two inches and a half or more toward the left than the point of the ſhare, if it were driven down as low as it: but it ſhould never be ſo low in any plow whatſoever. As to its bearing forwards, the point of the coulter ſhould never be before the middle of the point of the ſhare. It muſt be ſet obliquely with reſpect to the ſhare, as we have diſpoſed it in the figure of the wheel plow, and it muſt never be ſet much more ſlanting; for if it ſhould, it would have greater force to raiſe up the pole wedge, and would be continually getting looſe.

The three other coulters are to ſtand in the ſame poſture with this in reſpect of the inclination of their points to the left. This is a great advantage to them; for by that means when the fin is raiſed up by turning the handles toward the left, their points do not riſe out of the ground on the right hand as they otherwiſe would. With reſpect to their pointing forwards, experience ſhews, that every one of the three ſhould be ſet a little more perpendicular than the next behind it; ſo that the fourth coulter will ſtand neareſt to perpendicular of any of them.

None of the coulters ought to deſcend ſo low as the bottom of the ſhare, unleſs when the plowing is very ſhallow. It is always ſufficient that they cut through the turf, however deep the plow go into the ground.

When the plowing is to be very ſhallow, the fin of the ſhare ſhould be broad enough to cut off the fourth piece of the furrow.

The nut which ſerves for faſtening the piece to the beam of the plow ſhould have two oppoſite corners turned up, by which it may be driven round with a hammer. This has ſo great a force, that three of theſe will hold the beam and the piece as firmly together, as if they were one bit of wood. In dry weather the wood will ſhrink, and then the nuts are to be driven farther on. The ſame caution muſt be obſerved in other parts of the plow. Between the nut and the wood there ſhould be a thin piece of iron by way of bolſter: this prevents the nut from wearing into the wood, it muſt be ſomewhat larger than the nut, and of the thickneſs of a ſhilling. Some uſe a piece of leather, but when the nut is to be often ſcrew'd, iron is much better.

There muſt alſo be iron plates upon all the coulter holes both above and below. Theſe muſt be nailed on with nails made for that purpoſe.

Inſtead of a collar moving round the beam, 'tis much better to have a ſquare one with an open end, which ſhall faſten to it by a couple of crooks. Theſe muſt turn upwards, that they may not lay hold of any thing that ſhall be turned up under the plow; the front or cloſe end of this collar is to be a ſtrong iron bar, with ſeveral notches. Two pins are to be driven into the beam, juſt behind the ſecond coulter hole, one on each ſide: and there is to be another crook called a (C) from its ſhape, which is go over the cloſe end of the collar. Each end of this is a hook, and one of theſe lays hold of the croſs bar of the collar going into one of its notches; and to the other is fixed a link, which holds the tow chain to the collar.

The uſe of thoſe notches, and this fix'd poſition of the collar is this; that as the ſhare wears at the point, it always inclines a little to the right; and this is remedy'd by removing the crook into another notch of the croſs bar of the collar, ſo that the point of the ſhare is thus always kept in a proper direction. The length of each ſide bar of the collar ſhould be a foot.

We have ſhewn that the tow chain of the plow is faſten'd within the box by a ſtaff paſs'd through its firſt link, as the hook of the collar holds its laſt. This ſtake is commonly nailed to prevent its flying out of its place. When the plow is to be drawn a little nearer the crow ſtaves, the method is to take in another link of this chain, paſſing through the ſtake, and faſtening it as before: or it may be done better by taking hold of the crook of the collar, with a ſecond or third link of the chain. This ſhortening of the chain draws the point of the ſhare to the left.

For drawing of the plow there is faſten'd to the box an iron machine, called the wilds; this is very like the ſquare collar, only its legs are longer. The croſs bar at the top is notch'd, but only one leg of the wild are fix'd to this ſquare bar in the making: the other leg is looſe, and has a loop through which the other end of the croſs bar is put, ſo that it is fixed on at pleaſure. Both theſe legs of the wilds paſs through the box of the plow, and are faſtened in behind it by a couple of hooked pins. The holes cut through the box for letting theſe legs paſs are to be made ſlanting upwards, ſo that the fore parts of the wilds may be higher than the hinder; otherwiſe the upper end of the crow ſtaves will lean quite back when the plow is drawn. The uſe of the notches in the bar of the wilds, is to give the plow a broader or a narrower furrow. A double crook with a link is fix'd to this bar, and by this the horſes draw. If theſe cattle are tall, the traces muſt be long, elſe they will be apt to raiſe the wheels off the ground, and overturn the plow.

The legs of the wilds ſhould be eight inches and a half aſunder,

ſunder, and their length ſhould be nineteen inches: the links are to be ſix inches and a half long. They are to be put into two notches diſtant from one another, or elſe one wheel of the plow will advance before the other. When they are moved to the notches on the right hand, it brings the wheels toward the left hand, which gives the greater furrow; and on the contrary, when they are moved on the notches on the left hand, it gives the plow a leſs furrow, by bringing the wheels toward the right.

The height of the wheels we have mention'd already, as alſo the proper method of making one of them higher than the other: their diſtance ſhould be two foot five inches and a half, as ſet from one another on the ground. The crow ſtaves ſhould be one foot eleven inches from the box of the plow to the gallows that goes acroſs them; theſe are to ſtand upright upon the box, and they ſhould be ten inches and a half aſunder.

The pillow which croſſes the ſtaves below the gallows, is to be pinned up at its end by two ſmall iron pins, and it is convenient to keep theſe chained to it, that if they chance to drop they may not be loſt.

The height from the ground to the hole in the box where the tow chain paſſes through, is to be thirteen inches. This brings it to two inches below the holes of the wilds, on the hinder ſide of the box.

The height of the plow at the place where the other end of the tow chain is faſtened to the beam, ſhould be twenty inches from the level ground; and about the middle of the tow chain there ſhould be a ſwivel, that one end of the chain may turn without the other.

This is the conſtruction of the four coulter'd plow; and as it is founded upon the two wheeled plow improved to the greateſt perfection, the parts of that plow can never be ſo well underſtood as in the deſcription here given for their perfect and exact conſtruction. We have taken this opportunity of entering into the full and exact detail of them; and we have formed the figures relative thereto. It is neceſſary that he who would undertake to make or to give orders for the making of a four coulter'd plow, ſhould underſtand the conſtruction, parts, and compoſition of a perfect one with a ſingle coulter; and we have by this means avoided the repetition of a long and dry detail of the parts.

When the four coulter'd plow is made, let it be try'd with the ſingle coulters before the others are put on. There may be a fault in the work that cannot be diſcover'd, even by a judicious eye, till it is try'd; and this may prevent its going as it ought. That plow which will not go well with one coulter, certainly would not with four.

If the plow goes well with one coulter, then put in the other three; there is not much fear but it will alſo go well with them all. If it do not, then let the poſition of the three additional coulters be examined; and let it be ſeen in what that differs from the rule, laid down here for that purpoſe. That it differs in ſomething need not be doubted; for if they be diſpoſed according to theſe directions, the plow will go well.

To known whether a plow goes well, examine the furrow: if that be of an equal depth on the right hand and on the left; and if the plow turns it off fairly, it is right. If in the going of the plow, the tail of the ſhare, and the bottom of the drock bear againſt the bottom of the furrow; and if it goes eaſy in the hand of the holder, without preſſing one arm more than the other, the farmer may be aſſured it is a good one. Such a plow will go with four coulters as well as one.

CHAP. XXIX.

Of the management af a plow in working.

WHEN the farmer has his plow well made, let him ſee that he keep it in order; and employ a man who is able to manage it, and who has honeſty enough to take the neceſſary care: the farmer depends more upon the integrity and knowledge of his plowman, than on the qualities of any other ſervant.

The handles of the plow being made of that length we have ordered, are uſeful for the proper guiding of that inſtrument; but often the plowman will cut them ſhorter to favour his idleneſs. When they are ſhortened, he can bear his whole weight upon them, and in a manner ride inſtead of walking. If he ſhould play this idle trick with long handles, his weight would tilt up the fore end of the beam, and raiſe the ſhare out of the ground. The keeping the arms long therefore prevents this, and at the ſame time gives him an opportunity of fairly managing the plow to the greateſt advantage.

An awkward plowman will often over ſet the two wheeled plow; but a careful perſon hardly ever meets with ſuch an accident. The great danger is, at the going out at the land's end, from one furrow to another. But the ſkilful plowman lifts his plow a little round, and then holds up the crow ſtaves with the end of the beam, by preſſing his hand hard againſt the handle, while the plow lies down on one ſide; till the horſes, the wheels, and the body of the plow come nearly to a line in the beginning of the furrow: then he lifts up the plow and goes on.

Theſe little contrivances are very uſeful. They are more eaſily ſeen in the practice, than taught by words; but thus much may let the farmer know when his plowman manages his buſineſs right, and when he does not; and aſſiſt him in the giving one that is willing directions.

In the uſe of the four coultered plow, ſometimes the firſt or left furrow is apt to come through betwixt the firſt coulter and the ſheat, and in this caſe it falls upon the left hand ſide of the plow.

This, tho' not of much conſequence, yet is worth preventing, and the remedy is eaſy. Let the ſecond coulter ſtand a little higher than the third; and then the ſecond furrow holding the firſt at its bottom, will carry it over together with itſelf, and throw it on the right ſide of the earth board.

In this placing the coulter, let the farmer never ſet it ſo high that it does not cut the turf through. As to the firſt coulter, tho' it ſhould cut but an inch or two within the ground, the ſhare will break off the firſt furrow in raiſing it up.

If in working the coulters become clogged with pieces of the turf, a boy ſhould go by the ſide with a forked ſtick to clean them off.

The coulters being diſpoſed as we have deſcribed, will have more ſpace between them above than below; ſo that this clogging will not happen often, and when it does, the cleaning is eaſily performed. The farmer may know when he ſhall want a boy to follow for this purpoſe, becauſe it riſes not from the fault of the plow, but the nature of the ground. This in clear ground goes as free and as clean as any; but when there is a great quantity of couch graſs, its roots hold the turf together, ſo that it riſes in pieces, and hangs between.

In the common two wheel plow there is a great inconvenience, which is, the leaving a great part of the land unturned, from the ſhare's point going too much to the left.

The

The conſequence is, that the work is done irregularly, and often a great part of the ground which is covered by the broken earth is whole and untouched, and the weeds are found afterwards growing upon it.

Sometimes he will find it happen from the imperfection of the plow, and then he is to apply to the maker of it. The well going of a plow principally depends on the placing of the ſhare rightly upon the ſheat; it matters not that the maker can tell him, or ſhew him that it is right as it ſtands upon the ground, let him try it in ſome work, and never be ſatisfied till it anſwers its expectation.

This fault, though it ſometimes is owing to the make of the plow, may alſo riſe only from the folly of the plowman's ſetting: it is ſo that the point of the ſhare turns too much to the left: in this caſe it will always cut croſly, and leave a part of the ground untouch'd, tho' cover'd by that which has been cut, and is thrown over it.

There is no part of his buſineſs which the farmer is more under a neceſſity of following with his own eye: his intereſt is engaged, tho' the ſervants is not. It is eaſy to plow too ſhallow or too deep. Where there is a full ſoil, the deeper the plow cuts the deeper; but where the ſoil is ſhallow, and the bottom bad, let care be taken that the clay or whatever other bad matter it be, ſhall not be turned up with the ſoil.

When a land lies upon the deſcent of a hill, let it never be plowed ſtrait up and down, but croſswiſe. This has a double advantage: the horſes are not tired, as they would be with going ſtrait up and down, and the land alſo will fare a great deal the better.

Grounds upon the ſides of hills are poorer than others, and require a great deal of manure; and that is ſoon waſhed away from them by the rains, together with the fineſt part of their mould.

As the farmer would wiſh theſe grounds ſhould retain all the richneſs that he is able to give them, there is no method by which he can better ſtop the progreſs of this miſchief which exhauſts them, or keep their rich parts in them better than this of croſs plowing.

CHAP. XXX.

Of the advantage of plowing croſs wiſe on hilly grounds.

THAT the rich particles are diſlodged by the rains, and carry'd away with them is plain, for the waters runs off foul and thick. It carries off the lighteſt and fineſt part. This is what it can moſt eaſily diſlodge out of the reſt; and hold up longeſt. This is what ſhould ſupply the plants with nouriſhment.

This is diſlodged by rains moſt of all when the earth has been lately plowed; and in the method of plowing ſtrait up and down, where the farmer cuts ſo many trenches, for the giving it a clear and ſpeedy paſſage.

It ſhould be his buſineſs to ſtop and detain this rain water, which has taken up the riches of his ſoil; but this way he aſſiſts its ſpeedy running off. It is his misfortune that the rains have diſlodged the fine earth from among the reſt, and yet he not only lets it go off, but in the very plowing cuts it a multitude of paſſages. It is on the contrary his buſineſs to ſtop and detain it; becauſe the longer it ſtays the more it ſettles, and leaves more of this fine matter upon the land.

In the common way, the fine matter waſh'd out of the field, and according to the courſe of the deſcent, and the nature of the fence, it runs to another man's ground, or to ſome other ground of the farmer's, which does not want it; or it ſtops in the ditch and there lodges, feeding weeds.

This is the conſequence of plowing ſtrait up and down in hilly grounds, which is yet practiſed in ſome places, even in the moſt ſteep; and almoſt every where when the deſcent is ſmall. Where they plow croſs-wiſe, it has been to ſpare the labour of their horſes, more than with any other view: but there is a much more important reaſon.

Rains fall equally upon the ground, whatever be the manner of dreſſing it, but their effect will be different according to that method. Let us ſuppoſe an upland field of a light ſoil plow'd croſs-wiſe, and well waſh'd by a ſhower. The water is thick and yellow, being full of the richneſs of the ſoil; and it is for running down according to its natural courſe. It is ſtopp'd at every furrow. Very little of it gets out of the field. And the whole ſoil is better and more perfectly moiſtened by the rain, than it could have been any other way: the fine part which has been waſh'd from the ſurface, penetrating with the water, becomes mix'd with every portion of the mould.

This is a great advantage, and without any other conſideration, ought to influence the farmer never to plow any other way on theſe lands. Reaſon ſhould get the better of prejudice, but nothing ſhould get the better of experience. Reaſon never contradicts experience: where the fact is rightly ſtated, they always enforce and confirm one another.

CHAP. XXXI.

Of laying land in ridges.

A Great article in the rendering of land fertile, is breaking and dividing it into ſmall particles, whether this be done mechanically by the plow, or by fermentation from manures: that this is eſſential to the free growth of plants is plain, becauſe it is from the ſmalleſt particles they are nouriſhed, and breaking the land in this manner is the only method of giving the roots a free paſſage.

But beſide theſe, there are two other articles without which plants cannot thrive, theſe are a due degree of heat and moiſture.

Corn demands a moderate degree of each of theſe, and the farmer is to guide his practice in ſuch a manner, as to give it a ſupply without abundance. The farmer may defend his land from cold by fences, and he may keep it moiſt by tillage.

He is to communicate to his crop all good, ſo far as he is able, and to defend it from all ill.

One of the greateſt misfortunes that can attend a crop, is too much wet. This ſometimes happens from the particularity of a ſeaſon; but oftener from the nature of the land. In the firſt caſe, the farmer's care muſt be to find methods of carrying the wet off; when the latter, he muſt employ all his care to provide againſt it. Land that is too wet will never produce corn well, and to prevent this miſchief has been invented the practice of which we treat in this chapter, the laying land in ridges.

This is a particular ſort of tillage, and its effect is greater than thoſe ſeem to underſtand who employ it. They uſe it only to keep their lands from being too wet, but it has an effect in regard to the degree of heat, not leſs than with reſpect to moiſture.

We ſhall ſee, upon examining this practice and its effects, how well nature has taught people to uſe it. In the moderate ſoils that are frequent in Buckinghamſhire, and elſewhere, they frequently lay four ridges together: in Kent they often lay ſix, and in the lower parts of Eſſex eight, and in Huntingdonſhire, upon their wet and ſtiff clays, they ſow all upon broad lands, raiſing the middle of the ridges in ſome places two foot and a half higher than the ſide furrows.

rows. This expoſes thoſe tough and clammy ſoils to the ſun better than any other method, and drains them of the abundant wet.

Calcination by fire reduces clay to a rich mould, and draining it of abundant moiſture always abates its toughneſs. Theſe are the effects of dreſſing ſuch land in this manner. To have the full effect, let the farmer make the ridges run eaſt and weſt, where the ſituation will allow it, becauſe the ſun gets then at every part of them the better; and to promote farther the other good effect of draining, let him take care always to keep the furrows open and clean ſcowered. Theſe will ſerve to carry off the abundant moiſture; and to give it a free diſcharge from the ground, drains muſt be made in the loweſt places, that may run well into one another. This is ſo eſſential, that when the plow will not make them deep enough, it ſhould be done by hand with the ſpade; and the earth that is taken out ſhould, in this caſe, be carry'd to a diſtance, that it may not be trampled in again.

The chief deſign of laying land in ridges is, draining it, and making the corn grow properly dry: but we ſee that by a proper management it may be made to extend its benefits farther. In this caſe, of a clayey ſoil laid in ridges open to the eaſt and weſt, the ſun acts in a double way, not only giving it warmth, but by a gentle calcination of the ſurface, it reduces that ſuperficial part to a ſtate of greater perfection, and makes it a kind manure for the reſt.

The natural defects of many lands, otherwiſe good, are too much moiſture, and a defect of heat. The latter naturally ariſes from the former; for a quantity of water, detained among clay, or any other tough earth, becomes cold, and chills the plants that are raiſed upon it. The great remedy is laying the land in ridges. That the huſbandman may know when this is requir'd, as well as how to do it, we ſhall give him the following hints.

In many places the abundance of moiſture, and coldneſs of the ſoil, are obvious to the eye: the land is clammy and wet the greateſt part of the year, and this is not a condition in which it will bear crops to advantage. This plain diſcovery of the fault is moſt conſtant where the occaſion lies high, or where the clay makes the whole ſoil. But the ſame fault may be in the ground where this lies ſomewhat deeper, and though it is not perceived by the eye, the effect may be found the ſame. When a land has a thin, light, and looſe ſoil at the top, and a tough clay at a ſmall depth, the wet will run through the light earth; but it will lodge on the clay. This is a deceitful kind of land. It will look dry, when it is very wet below; and this in the place where roots find their nouriſhment.

Other wet lands ſhew themſelves to the eye, but the fault of theſe is to be ſeen in the growth of the crop. When it is in great degree it diſcovers itſelf on opening of the ground, but in a leſs it is capable of doing great hurt: and it is then known by the aſpect of the corn or other growths. If the leaves look ſickly and yellow, if they droop, and the ſtalk riſes ſlowly, we may be ſure this is the fault of the ſoil, and that it is wet and cold: however dry and fair the land may ſeem on the ſurface, it is wet at a ſmall depth.

When the cauſe is known, the remedy is eaſy by laying up the land in ridges. If the deſcent of a hill do not prevent, let theſe be open to the ſun, by being laid eaſt and weſt: thus while the water is carry'd off, the ſun will calcine, and every day improve the clayey matter that lies on the ſurface, from the effect of plowing.

The water runs off from the ridges into the furrows, and is thence to be carry'd by proper drains out of the land.

CHAP. XXXII.

Of the wet land on hills.

THE intent of laying land in ridges, is to drain it of wet. As there are ſeveral kinds of lands apt to be wet, and thoſe, according to their differences, require ſome variation in the manner of applying the remedy, it will be uſeful to conſider them ſeparately.

The two principal kinds of lands liable to be chill'd by wet, are thoſe on hills where there is a bed of clay under the mould; and thoſe in level grounds, with a very deep and very ſtiff ſoil.

Rains fall upon this hilly ground, and ſoaking thro' the mould, are detain'd by the clay. They cannot enter this, and they ſpread themſelves among the mould above; and the whole approaches to the nature of a bog; the ground being ſoft, and rais'd above the natural level by the water ſpread among it.

When this is the caſe in a great degree, no plowing can remedy it. Trenches muſt be cut a-croſs with a deſcent, to carry the water off. And they may be fill'd up with rough ſtones, and cover'd over with earth again, ſo that all may be wrought as a level ſurface.

When the wet is in a leſs degree, it may be diſcharg'd by laying the land in ridges. Let the farmer firſt examine whether the ſtate of the ground will or will not admit a cure: if he thinks it will, this is the manner in which he is to ſet about it.

Let him plow the land in ridges, almoſt croſs-wiſe of the hill, but a little ſlanting; in this way their parting furrows lying open will each ſerve as a drain to the ridge next below it: for when the plow has made the bottom of theſe a few inches deeper than the ſurface of the clay, the water will naturally and ſecurely run to their ends, without riſing into the mould, provided no part of the furrows be lower than their ends.

This ſlanting ſhould be more or leſs, according to the form and declivity of the hill.

There are two ways in which water that falls upon an hill runs off. The one is on the ſurface, and the other is between the mould that makes the ſoil, and the clay of the bed under it. 'Tis this ſecond courſe we are to conſider on theſe occaſions; for on that depends the damage we propoſe to rectify. This is the ſource of what we have directed, as to the diſpoſition of the ridges; and it will be found, that as only this method of ridging could keep that part of the ſoil dry, ſo there is no direction in which they could run, that will ſo well ſecure the advantage, as the carrying them with this ſlant croſs-wiſe of the hill.

In this caſe the conſideration of laying the ridges eaſt and weſt, muſt give way to the croſs direction with reſpect to the deſcent of the hill. We have mentioned, under that head, that there were exceptions; and this is the principal: in this, as in all other caſes, the greater convenience is to be conſulted, and the leſſer is to give way to it.

The farmer will often find two things would be right, both of which together are impracticable: he muſt, in this caſe, content himſelf with taking the beſt.

The way of working on this occaſion is to plow the ridges in places, without throwing any earth into the trenches. The ridges will be plain at the top: and the rain water will ſpeedily run downwards to the next trench, and thence to the head land, and ſo out of the field.

A great deal of land that might be ſaved by this eaſy method, is left to produce little or nothing by the common treatment.

CHAP. XXXIII.

Of the wet land that lies level.

THIS is the other kind of land that is liable to be wet, and may be mended by the tillage in ridges. Sometimes there are ſprings on hills which makes the cure more difficult: in theſe deep, wet, and ſtiff ſoils that lie on a level, the cauſe is always in the rains alone. But this will ſometimes put the land into as bad a condition.

When a deep ſtiff ſoil lies flat, and is plow'd ſometimes one way, and ſometimes another, it will hold water a long time. By that misfortune the plow is kept out two or three weeks longer than if it were in round ridges: and ſometimes its flatneſs keeps it from drying till the ſeaſon of plowing and ſowing too are loſt.

The farmers are backward in plowing the hilly wet grounds in ridges, and more in this. They ſay it prevents croſs-plowing, which they count a great advantage, and they think they loſe a part of the ground by the open furrows. But theſe are miſtakes: on ſuch notions which he receives upon credit, depend the greateſt part of his diſappointments and loſſes.

Croſs plowing is oftener a hurt than a benefit to land: this is certain, and any one accuſtomed to farming, who will examine what he from time to time ſees, inſtead of taking all things upon truſt, will find it ſo. This therefore is an objection, and the other is intirely an error: for, inſtead of loſing any ground by ridges, it is poſſible to gain. In the common practice none is loſt, and managing wiſely, much may be gained.

Ground is gained for the farmer's purpoſe when its ſurface is increaſed, and it is capable of bearing more corn: this is plainly practicable in the plowing in ridges. If we allow two foot in ſixteen for an empty furrow, the difference of ſurface between the reſt as it lay flat, and as it is plowed into ridges, is much greater in his favour than this proportion is in loſs of quantity. All the ſurface in ridges is capable of bearing corn, and it is ſo much ground gain'd to the huſbandman.

This is the plain and abſolute fact: arguments have been raiſed againſt it; but they are frivolous or falſe. We name them only that the reader uſed to ſee things thus canvaſſed, may not think we overlooked them. To the huſbandman they are of no importance, and to the curious it may be enough to ſay, that the doctrine of the perpendicular growth of plants, on which all their cavils are founded, is in itſelf erroneous.

The ſurface of a field meaſures more in quantity when in ridges than when flat; and all its ſurface, the empty furrows excepted, is capable of bearing corn. This is a ſhort ſtate of the caſe. Theſe furrows have been taken into the computation, and the difference is in favour of the land in ridges. No ſophiſtry can get the better of ſo plain a fact; and it is upon this fact, and the evident advantage that wet and cold lands receive from this kind of tillage, that we recommend to the farmer the tilling his ſtiff, cold, moiſt, and flat lands, in this method.

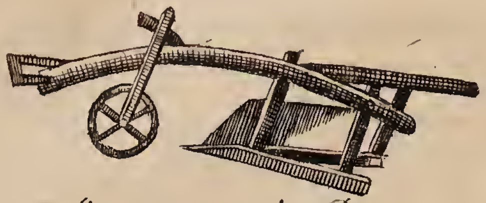
The quantity of a crop does not depend upon the ſpace there is for the corn to ſtand in, but on the quantity of earth there is for its roots to ſpread in for getting of nouriſhment: the roots of corn ſpread near the ſurface, or at a ſmall depth under it; and the increaſe of the ſurface of ground in meaſure, is in reality an increaſe of it in quantity, ſo far as the growth of theſe plants are concerned.

The increaſe of ground is a certain and a conſiderable advantage obtained from the plowing in ridges, but it is not the only benefit. Beſide keeping the land warm and dry, the ridges are a ſhelter for one another, and a defence againſt cold winds; and when the field has been exhauſted by frequent ſowing, the ridges may be made juſt where the furrows were, and there will be the advantage of a great deal of freſh ground.

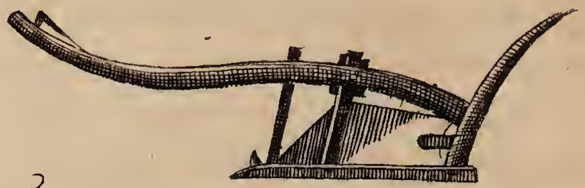
Having explained the benefits of ridges, we ſhall give the farmer ſome cautions about the making of them.

In a deep ſoil let the ridges be made narrower, and in the ſhallower let them be broader. Let him overlook the work, and have a particular regard upon deſcending or ſlanting grounds, to the direction and courſe of the furrows; and if he intend to follow the horſehoeing method, which we ſhall deſcribe hereafter, and which in a moderate and proper uſe has great advantages, he ſhould rather chuſe a land that is dry in its own nature, than one that wants this aſſiſtance of ridges, for they are often an interruption to that practice.

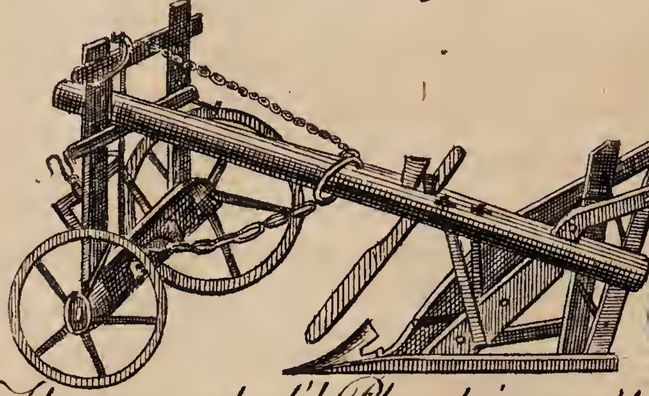
The furrows ſhould be deep or ſhallow, according to the



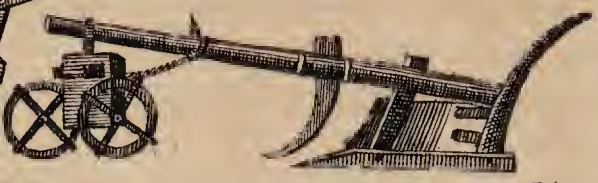
The one wheel'd Plough



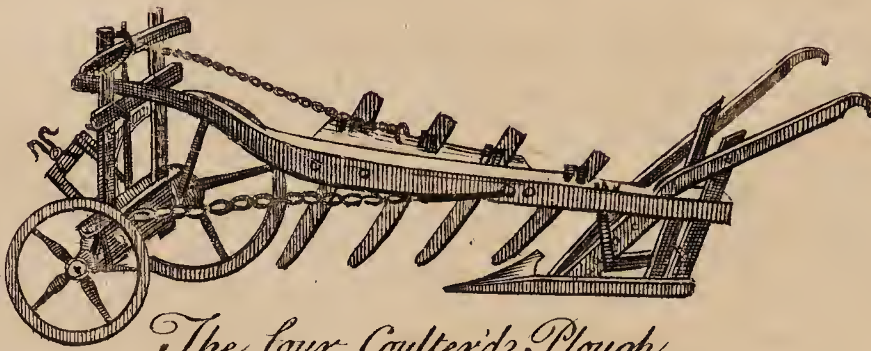
The original Plough without Wheels



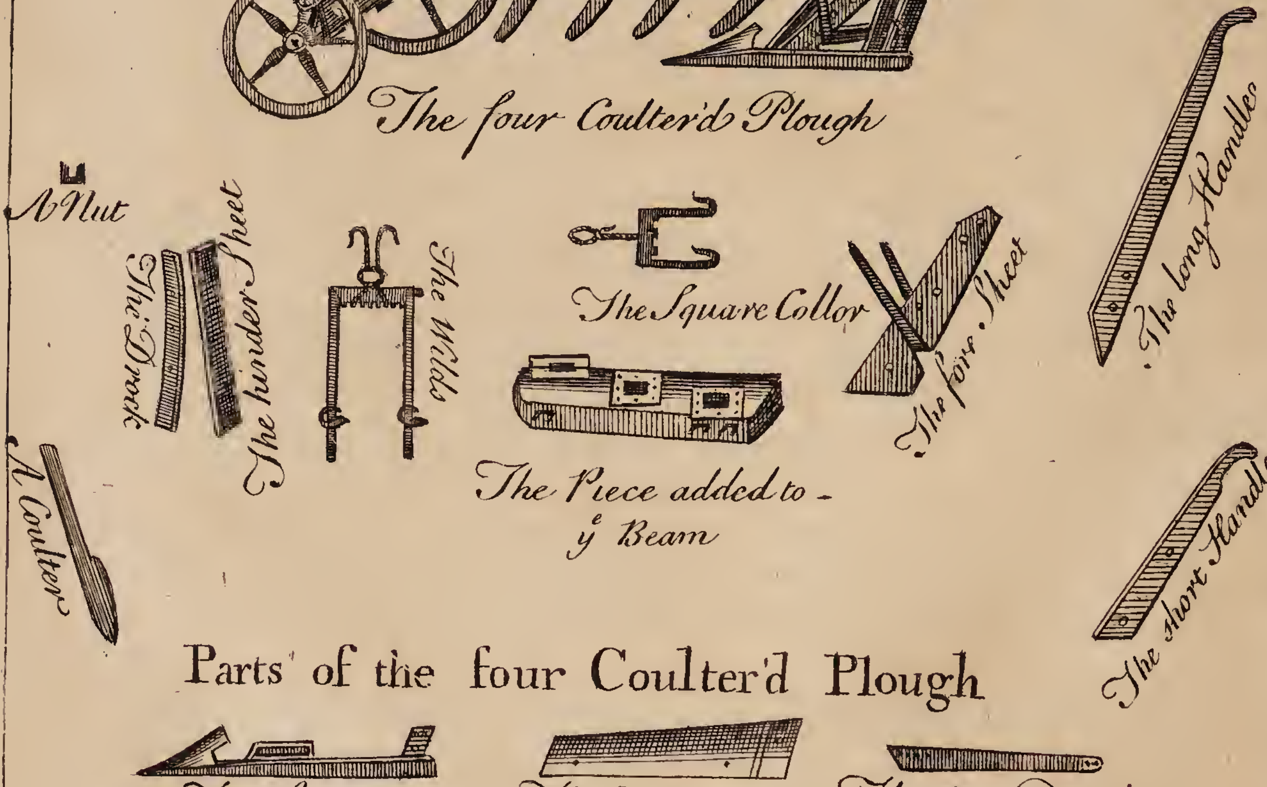
The two wheel'd Plough improv'd



The original two wheel'd Plough



The four Coulter'd Plough



A Nut

The Drock

The hinder Sheet

The Wilds

The Square Collor

The fore Sheet

The long Handles

The Piece added to ye Beam

A Coulter

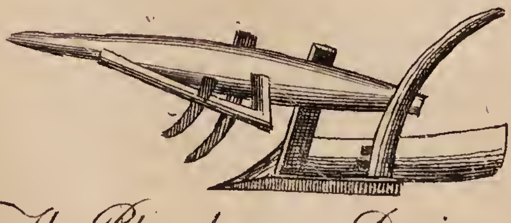
The short Handle

Parts of the four Coulter'd Plough

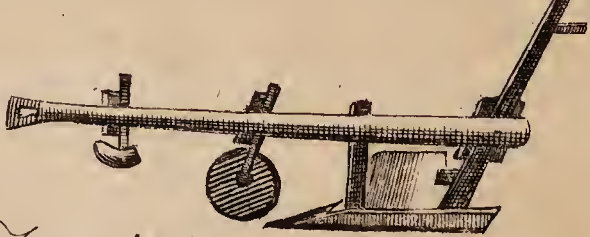
The Share

The Earth board

The Ground Wrist



The Plough to cut Drains



The wheel Coulter'd Plough

the depth of the ſoil. When lands are improved by this method of laying in ridges, wheat and rye need not be ſown upon them ſo early as they are in their natural ſtate; but they muſt ſtill be ſown earlier on them than on lands that are naturally dry, and warm. For ſummer corn, on the contrary, the cold land muſt be ſown laſt.

In many of the weſtern counties they ſow their barley with a broad caſt upon broad ridges; and in Kent and Eſſex they frequently ſow it on narrow ridges like wheat: in this caſe there are to be two ſmall harrows uſed, one of which is to take each ſide of the ridge. After this they roll it with a belly roll, which goes between the ridges.

CHAP. XXXIV.

Of the advantage of tillage by the four coulter'd plow.

WE have deſcribed the conſtruction of the four coulter'd plow, and having now treated of the nature and advantages of plowing in general, we ſhall be underſtood with eaſe in recounting the benefits that attend the uſe of that inſtrument.

Nothing gives the huſbandman more trouble in plowing than a ſtrong turf; and there is no method by which he can effect this ſo well, as by the four coultered plow. The richeſt land is moſt ſubject to this tough head; and the deeper the ſoil the larger muſt be the furrows; for if they be too ſmall, a great part of the mould will be left unmoved. A narrow furrow cannot be plowed deep, becauſe the plow will continually ſlip out from the hard land toward the right, unleſs the riſing furrow be of ſufficient weight to preſs it toward the left, and keep it in the work. The deeper the farmer goes, the greater weight is required to preſs the plow: ſo that the deeper the land is, into the larger furrows it ſhould be plow'd. If the work be done with a common plow of the very beſt invention, the conſequence is, that in a very ſtrong land which has reſted ſome time, it is the buſineſs of many years to get into a good tilth. This the farmer has never fail'd to find, and his heart will go with me as he reads this account. The price of ſuch laborious tillage often comes ſo high, that it reduces the profit of rich land below that of poor.

It is a common pretence among plowmen, that when they have ſlightly broke up a land at the firſt plowing, they will go deeper, and do it better the ſecond; but they promiſe what cannot be performed. It is of the utmoſt importance to the farmer to cut and divide ſuch ground in the moſt perfect manner: the common plow cannot do it well, and ſeldom does it otherwiſe than by halves; nor is there any other remedy that is not too expenſive. For this reaſon the four coultered plow is propoſed. It is uſeful on many other occaſions; but it was invented for this, and will not fail to anſwer to his perfect ſatisfaction. Such land muſt not be plowed a ſecond time in wet weather, for that will make the weeds grow, and if it be done in dry, the plow will never go deeper than it did at firſt.

'Tis therefore the common tillage does not anſwer on ſuch land. The farmer ſees it, but he knows not how to help himſelf. If he attempts it by the breaſt plow, the work is very expenſive; and if there be many ſtones in the ſoil, it is altogether impracticable. If the turf be pared off very thin with a breaſt plow, and laid to rot before it be plowed in, in the common way, this may ſucceed; but if the ſeaſon be wet, it will grow inſtead of rotting; ſo that in moſt caſes that is a very hazardous undertaking, and in many it is not all practicable.

Even digging up the turf with ſpades would not anſwer in this ground, unleſs it were done extreamly thin, which will never be procured to be faithfully executed at any expence. As the ſpring is uſually wet, there is danger in cutting up the turf for rotting any way at that time, for fear of its growing; and if it be deferred till ſummer, the plowing afterwards in dry weather on ſuch a ſoil will be very inconvenient, and the wheat ſeaſon probably loſt.

In theſe exigencies which happen moſt upon the richeſt land; if the farmer will venture upon the breaſt plow, or that ſlight plowing which only cuts off the turf, let him do it not in the common way, but have recourſe to that particular kind of plow, which we have directed to be made for the cutting up the turf for burnbaiting, and the roller deſcribed with it. Theſe inſtruments will give him an opportunity of getting up the turf, and cutting it to pieces in a much more eaſy and expeditious method; but this is by no means comparable to doing it at once by the four coultered plow.

In the common way of plowing, this kind of land cannot be cut in furrows of leſs than ten inches broad, and to that is owing all the diſadvantage: the land is ſeveral years before it can be ſufficiently broke, and graſs and weeds grow with the corn. But with the four coulter'd plow this ten inch furrow is cut into four equal parts, ſo that there is no part above two inches and a half broad, and this is done thoroughly; for the coulters cut to the whole depth of the ſoil, tho' it be fifteen or ſixteen inches.

This is a prodigious advantage, and it is done as eaſy as by the common method of plowing: for before the furrow is raiſed by the ſhare, the earth lies faſt, and makes an equal reſiſtance againſt all the coulters, ſo that they all pierce quite through it.

The dividing the furrows length-wiſe into four parts, is not all the advantage that is gained by working with the four coulter'd plow. This would in a manner make one plowing anſwer the purpoſe of four: but beſide this, it is a natural conſequence that the furrow is divided croſs-wiſe; for the ground-wriſt preſſes and breaks the right hand quarter; and the other three quarters, as they muſt neceſſarily bend in coming over the earth board, break alſo in falling into many ſmall pieces.

Nothing of this happens in the working by the common plow, where the furrows being of ſuch a thickneſs as very well to keep entire; when the ſoil is any thing ſtrong, it falls whole. Counting therefore the firſt diviſion made by the coulters, and the ſecond by the natural breaking of the earth, there is no queſtion but the four coulter'd does at once plowing, divide the ſoil more than twenty times as much as the common plow. It has therefore twenty times the uſe, and does the farmer twenty times the ſervice. This is eaſily practicable, and he who ſhall try it will find, that far from our making the moſt of what it will do, frequently the advantage is much greater. When the mould is of a right temper, the earth board in turning the furrows off will crumble them to pieces: they ſhall fall into a kind of duſt, and hardly ſuch a thing as a lump of any ſize will remain in the field.

We have ſhewn that the breaking and dividing the earth into ſmall particles, is the great point in which the benefits of tillage conſiſts; and it is evident from the effects, that one or two common ſlight plowings after this with the four coultered kind, will reduce the ſoil to duſt. The whole depth of the ſoil is directly brought into tilth; and the turf being cut into theſe ſmall pieces, rots and decays preſently, adding a kind of manure to the richneſs given by this breaking of the ſoil.

The greateſt uſe of the four coulter'd plow is in conquer-ing a ſtrong turf. When turf is cut up large as it muſt be by the common plow, the pieces lie hollow, and as the air can come to them, they grow; but being cut into ſuch ſmall ſhreds by this kind, they lie cloſe and rot, becauſe they have not air for growing. The length of the roots is a great diſadvantage in the common way of plowing; for they will ſhoot from the joints; in the uſe of the four coulter'd plow, they are not only torn up, but cut to pieces; and thoſe are ſo ſhort, that if they are buried they rot; and if expoſed on the ſurface, they ſhrivel and wither; ſo that either way they periſh.

Any weather will do well for plowing with this, in which a plow can be uſed; but wet is beſt; it may be uſed when the ground is ever ſo moiſt, provided the horſes are not mir'd in drawing it; and there is no way in bringing land into tilth in ſo ſhort a time or with ſo little expence.

As we have mentioned the great advantages, we ſhall name alſo its inconveniences. The four coulter plow is hard to draw, and its beam being long it lies farther behind, and comes heavier after the horſes; its whole weight alſo is conſiderably greater than that of the common plow.

For this reaſon it will be proper to add one horſe to the uſual number for the drawing of this plow; or if a ſtronger team be employed, the difference will not be ſo much felt.

The difference is not ſo great but that it is near as eaſily drawn in moiſt weather, as the common plow is in dry on the ſame ground, and at the ſame depth. One great reaſon of its following heavily is the depth to which it cuts; and this is ſo great a benefit, that it would be idle in the farmer to grudge the adding of one horſe to his team for obtaining it; the four coultered plow will cut two ſpit deep, which is a prodigious advantage; but when ſo much is not required, it will cut as ſhallow as any other kind, and then the weight is very little felt.

The cutting the furrow into four parts, adds to the pull of the horſes, but it is not much. When the ground is in a right condition, and the coulters are in good order, they cut through very eaſy; the furrows being thus divided, riſe ſo much the more freely upon the ſhare and earth board, than they would if whole, that perhaps as much is gained in the eaſe of working this way, as is loſt the other.

Plows with two coulters inſtead of one have been uſed in different places, and always with the greateſt ſucceſs; the adding a third and a fourth, muſt increaſe the advantage;

and upon the rules we have given, the farmer cannot fail of having it done to his ſatisfaction. The difficulty is not great, but the people who make plows are very ignorant: nothing could have brought the plow with two coulters into diſuſe, but the bad way of fabricating it: and nothing but the properly putting together this new kind can be wanting to the bringing it into general favour.

CHAP. XXXV.

Of the general benefits and advantages of plowing.

WE have conſider'd plowing as the capital operation of the huſbandman's profeſſion, and have therefore treated it very much at large with reſpect to the ſtructure and make of the inſtrument, and methods of uſing them: that we may leave no uſeful part neglected, we ſhall here lay down whatſoever farther of general matter it may be fit the practical huſbandman retain in his memory.

The plowing of fallows is a great advantage to them; and tenants are bound by articles to perform it at certain periods for the benefit of the landlord. What is required by the owner, will be alſo, at proper ſeaſons, a benefit to the perſon who rents the ground; and in general the expence employ'd in plowing, will bring in many times the ſum in the produce. The old authors ſay, the advantage of fallowing conſiſts in two things; expoſing the ſoil more to the ſun and air by turning it up; and breaking the lumps by frequent ſtirring. This is the old doctrine: it is found in theſe words in Markham, and that innumerable ſet of writers who have copied him. This is the principle upon which the horſehoeing huſbandry is eſtabliſhed: therefore it is idle to conſider it as a new doctrine.

Mr. Tull was a perſon of great induſtry and ſagacity. He read carefully what had been written on huſbandry; and he adopted the beſt things; and improved them. His ſyſtem is new, but the foundation of it is as old as any thing we know of huſbandry. It is unjuſt to accuſe it of novelty and whim, the principles on which it is eſtabliſhed are old and true.

The plowing of fallows, beſide breaking the ground, kills weeds; turning up their roots to be wither'd by the air, and overſetting the ſeed ſhoots before they exhauſt the land.

A great caution to the farmer is this, that he harrows no more down in winter than he ſhall quickly be able to raiſe up again in ridges; for if it get wet while it lies flat it will grow poachy. This is the caſe moſt in wet lands, and theſe frequently breed quantities of weeds upon it. The beſt way is to harrow in an afternoon, what is to be plowed the next morning; or to harrow early in the morning, what is to be plowed a few hours afterwards.

If the ſummer have been wet, the land will be full of weeds: in this caſe let the farmer plow it up early in winter to kill the uſeful growth, and to mellow the ſoil.

The ancient writers ſpeak of a plow that was managed by one man only, who could very well both guide and drive. Such a kind may be made upon the one wheeled plan; it may be light and ſmall, a ſingle horſe may draw it, and a ſingle perſon manage it: but this, though familiar, will be of a limited uſe, for it is fit only for a light and well wrought ſoil, and is to be uſed only in ſowing time. Such a one it may very well be worth the farmer's while to have when he has that kind of land.

They uſe at this time, in ſome parts of the weſt of England, a plow that has neither wheel not foot. It is made upon the principle delivered in Blith's huſbandry, but it does not anſwer ſo well as he ſeemed to think it would. The uſe of it is confined to ground that is clean and even, for where there are roots or irregularities, it does very poorly.

The farmer is to take his choice, ſuiting the kind of plow to the uſe. Theſe two laſt we have named here, becauſe tho' good on particular occaſions, they are not to be rely'd upon in general practice.

Dr. Plot and others have talk'd of digging ground for corn with the ſpade, and managing a field as a garden. There is no doubt of the ſucceſs of this, but the expence muſt be too great; and by the methods already directed, the ſame advantage may be obtained with more eaſe, and at leſs expence.

There is yet another method to be named on this occaſion, in which the plow and ſpade are employ'd together, this is called plow-trenching. It is uſed in deep light land. One furrow is plow'd, and half a dozen labourers following at proper diſtances one from another with ſpades, are to dig in the furrow, and throw up the earth on the glebe turned by the plow. While the diggers are at this employment, the plow is to turn up another furrow at a reaſonable diſtance; after which the labourers are to do the ſame there, while the plow is turning the upper earth of another into the former trench.

The principle upon which this is founded is right, but the method in the higheſt degree aukward. We have named it that the reader may know what plow-trenching means; but we have delivered methods of anſwering the ſame purpoſe in ſo much eaſier a manner, that this will never be found worth his while.

CHAP. XXXVI.

Of the benefit of converting paſture into arable land, and of continued plowing.

WE have mentioned the propriety there may ſometimes be in changing paſture into arable land, to keep up the proportion of the two: but this is not the only conſideration that may lead to ſuch practice. Paſtures on certain ſoils are apt to ſpoil themſelves, and that when they are rich as well as when poor.

Moſs is a great enemy to good paſturage, and frequently land are over-run by it. In this caſe, if the proper manures prove inſufficient, the farmer muſt have recourſe to plowing. That always ſucceeds: there is no way of deſtroying moſs like it; and after a few crops the land may be laid down for graſs again.

In barren and neglected land, plowing is the immediate method of improvement. The breaking the ſoil gives it fertility, and kills the weeds, by tearing up and expoſing their roots.

Sometimes a wet ſummer will fill a land with weeds after the laſt plowing in the fallow, by which it was preparing for barley; in this caſe it muſt have another ſtirring during the winter. Some tear them up with a harrow; but plowing is much better; and the land is then to be laid up high, that it may keep dry the remainder of the ſeaſon: by the effects of froſt and air after this, it will be prepar'd for the ſeed time in ſpring.

The common method of farming is by the uſe of tillage and manures jointly, and it comes at a very moderate expence. Suppoſing the land to be out of heart, and to take in the whole ordinary compaſs of the buſineſs it is this. In April, they lay on twenty load of dung to an acre, which coſts about a ſhilling a load; the ground being already in tillage, there will require two plowings to prepare it for wheat. Each of theſe will be about four ſhillings an acre, and the land will be then ready for wheat in the beginning of October; the ſeed will coſt about five ſhillings a buſhel, and about two buſhels will be required to an acre: the weeding, reaping, and binding, will afterwards coſt about five ſhillings an acre more: and the inning of the harveſt, and repair of fences, may be ſet at ſix ſhillings an acre: the price of thraſhing is according to the richneſs of the crop, for the labourer is paid by the buſhel. Here is all the expence, and all the trouble, and the harveſt, at a moderate computation, yields thirty buſhels of wheat an acre.

After this, the land will very well bear two crops, one of barley and another of peaſe, or the like.

Theſe crops are of leſs value, but they come at a leſs expence. Barley is mowed inſtead of reaping, ſo that the great charge in that article is ſav'd; and peaſe being cheaper in the ſeed, and requiring to have the ground but once plowed, comes yet more reaſonably.

Seven ſhillings an acre is ſaved in the crop of barley, and thirteen ſhillings in that of the peaſe, beſide the ſaving of dung, ſo that the charge of theſe crops is much leſs than that of the wheat, as well as the price in the produce.

This is all that the country farmer in general knows of huſbandry, and thus he practiſes it. Yet even this way the profit is ſuch, that he can live and lay up ſome money. The expence of an acre of ground for three crops, is about five pounds, thirteen ſhillings; and the produce of the three, computing in the moſt moderate way, is about eight pounds.

This ſhews huſbandry to be a profitable occupation; but when we come to the better practice of it we ſhall find the produce of land, where the moſt expence is employed, is ſix, ſeven or eight times equal to the charge, and often much more.

This may tempt ſome into the profeſſion, who have genius capable of improving it, which will be an advantage not to themſelves alone, but the kingdom; and it may ſhew thoſe who are employed in it already, how extreamly it will be worth their while to ſtudy the rules and nature of its operation more deeply; as every part of their additional knowledge will be an addition to their income.

CHAP. XXXVII.

Of harrowing.

THE great purpoſe of tillage is to break the earth: the plow begins this work; cutting it up from ſome depth, and throwing it by, more or leſs broken, according to the nature of the ſoil and the form of the inſtrument: but though this is a material part, it is not all. The harrow and other inſtruments follow, whoſe uſe is to break and divide the furrows ſtill more.

In the old huſbandry they employ'd men to follow the plow with inſtruments called hacks; theſe were a kind of hoes, but ſtronger in the handle, and hollow in the blade.

The hackers follow'd the firſt plowing, and cut and hack'd the larger lumps to pieces, and after theſe followed the harrowing. The preſent practice having greatly improved the plow, there is no need of that expenſive manual labour, but the next operation to plowing is harrowing.

The harrow is an inſtrument armed with iron points, which being drawn over the ground tears up the lumps, and breaks them to pieces.

It is drawn by horſes, and according to its form requires more or fewer, and does more or leſs ſervice; but in general it breaks the ground, and brings up a great deal of good mould.

Various methods are uſed in ſowing, in different places, and with reſpect to the kinds of the crop, theſe will come hereafter into conſideration. But here it may be proper to obſerve that the harrow, beſides breaking the ground, is uſed alſo in covering the ſeed.

It is performed one or more times, for breaking the clots, and when the corn is ſown, the harrows are drawn over it again, to cover it. This anſwers a double purpoſe; for beſide the covering the ſeed, it breaks the clods again, and ſcatters a fine duſt over the grain, which is of the greateſt ſervice in its firſt growth.

The plow anſwers to the purpoſe of the ſpade in gardening; and the harrow ſerves in place of the rake.

The lighter and looſer the earth is, the more compleatly the plow breaks it, and the leſs need there is of the harrow: but there is no ground that will not be the better for that harrowing which covers the ſeed. When this is omitted, the corn is thrown among looſe clods of earth. It is left naked, and is ready for vermine; and when it ſhoots has neither fine mould about it, nor is able to penetrate theſe tough lumps. It languiſhes therefore in a ſoil that would, in proper order, ſupport it, and this proper condition is given it by the harrow.

Let the huſbandman while he makes himſelf ſenſible of the advantages of harrowing, be cautious that he do not expect too much from it: it is an error the preſent farmers very frequently run into. They neglect to give their land a due plowing, truſting to the harrow to make it fine. When they have thrown in their ſeed, they go over it with this inſtrument; and being ſenſible the clods of earth muſt be broken, and that they have not done this ſufficiently with the plow, when they ſee once or twice harrowing does not effect it, they go over the ground again and again: the feet of the horſes thus tread the ſoil into a hardneſs that is very unfit for the growth of any thing.

CHAP. XXXVIII.

Of the various kinds of harrows.

THE harrow as it follows the plow in uſe, probably was the inſtrument next invented after it. It was clumſy and inconvenient in its firſt contrivance; and has been, from time to time, improved.

The common harrow conſiſts of croſs beams and iron ſpikes; and ſhould be made firm and ſolid. Let him ſee the ſpikes, or tines, are large and well fixed, and in the working let him have an eye that it go evenly over the ground.

The great harrow differs from this in its bulk, and the ſolidity of its ſtructure. It is a ſtouter inſtrument, and every way better fitted for ſervice. It conſiſts of eight beams, diſpoſed croſs-wiſe, as in the common harrow. Theſe are ſeven foot long, and four inches and a half ſquare. The tines, are like the wood-work, large and maſſy; twice as thick, and once and a half as long as thoſe of the common harrow. The wood-work ſhould be aſh, and if it be not framed very well together, it will tear itſelf to pieces preſently in the working. The tines are to be placed at the ſame diſtance as in the common kind.

The uſe of this is for breaking the ground, the ſeed is to covered in the ſame field with the lighter harrow. This requires three horſes to draw it; and in ſtrong lands ſometimes more; but by its weight, and the length of the tines, it tears away very deep, and has a force to break the clods much better than the common kind. This is fitteſt for ſtubborn land; and is there of ſuch ſervice that the farmers think its effect equal to a ſlight plowing.

It may be dangerous to truſt to it in this reſpect ſo far as to neglect the neceſſary plowings; but following theſe and in ſome lands following the roller, it will be of vaſt advantage.

The drag differs in nothing from the great harrow but in weight. The great harrow is ſufficient for all its purpoſes, therefore this invention was unneceſſary.

The drag is compoſed of eight beams, each eight foot long, and of great thickneſs: they are placed croſs-wiſe, but at large diſtances; and the ſpikes which are very thick and long, ſtand at greater intervals: it cannot be managed with leſs than four horſes, and ſometimes they add a fifth, the four in couples and the odd one alone in front. This way it is lugged along very unevenly and irregularly; it digs deep, and tears up a great deal, but the diſtance between the tines makes it leave alſo a great deal untouched, and many clods unbroken.

The principal uſe of theſe drags, is on land newly plowed up from ſward. When the ſoil is rich, and the turf tough, there is nothing more difficult than getting the land into tilth. We have explained theſe difficulties before, and recommended the four coultered plow.

When a land of this kind has been plowed up in the common way, the furrows being large, the turf lies in long ropes, and will continue growing. To prevent this, theſe furrows muſt be broke to pieces. This has been tryed by croſs-plowing, and the drag, but both with little ſucceſs.

In the common way with the plow, they lie too looſe to make a due reſiſtance to the coulter; they riſe before it, and are dragged into irregular heaps, and thus left about the field inſtead of being cut to pieces. The turf, inſtead of rotting, grows on; and defeats the purpoſe of the tillage.

With the drag it is ſtill worſe. They draw this a-croſs the field to tear the graſſy furrows to pieces; but it cannot ſucceed to any purpoſe, for theſe furrows are firm and tough, and require a keen edge to cut them. As the coulter could not do it in croſs plowing, it is impoſſible the tines of this drag ſhould; for they have no edge. In general,

ral, although ſome parts are torn in pieces this way, the moſt of the turfy matter is in a worſe manner dragged up in heaps, and the under part of the earth is often left bare for great ſpaces.

This is not anſwering the purpoſe: we have ſhewn what method ſhould be uſed; and as this inſtrument does not ſucceed for this, neither will it anſwer to any other uſeful purpoſe. We have mentioned its form and make, that nothing might be deficient; but we adviſe the huſbandman to have nothing to do with it: let him truſt to the common harrow in light ſoils, and to the great harrow in the others.

We are yet to mention another kind of harrow, ſince it is cuſtomary to call it ſo, which is uſed in graſs lands.

This is not compoſed of beams and tines, but of ſome ſlight wood-work, and buſhes; it is thence call'd the buſh harrow, and is uſed for ſpreading the dung and other manures, over the grounds. The benefit is very great, tho' of a kind altogether different from that of the other. The uſe of that is to break the earth, the buſineſs of this is to ſpread what is laid on for enriching it.

We have treated of thoſe manures which are to be uſed on paſture grounds. Whichever of theſe are employed, let the farmer as ſoon as he has got, ſpread it upon the ground, ſend in women or children, or others who work cheap, to pick up the ſticks, ſtones or whatever rubbiſh may have come among it; and then have recourſe to the buſh harrow, for dividing and diſtributing the manure.

Whatever care may have been taken in ſpreading it by hand, many of the clods will remain unbroken, and it will lie thicker in ſome places than others; it muſt be broke perfectly, and ſpread equally; and this is the office of the buſh harrow.

If the manure be of a tender kind, as the bottoms of hay ſtacks, rotten dung, or the like; he may immediately draw this harrow over it: but if it be harder, as the mud from ponds that has ſome firmneſs, or the like, let him leave it ſpread on the ground for ſome days; and after the ſun has crack'd the lumps, take the advantage of the firſt ſhower, and then uſe his buſh harrow.

Its make is plain and natural. Nothing ſavours ſo much of the old huſbandry.

The original buſh harrow conſiſted of a hawthorn cut freſh from the edge, with a little load to preſs it down:

this is ſtill uſed in ſome places, and, when rightly managed, does as well as any.

Let the farmer look among his hedges for a ſmall leav'd buſhy hawthorn: and chuſe the moſt ſhrubby he can find. Let him cut down a large ſtem, and laying it on the ground beat it flat with a board; ſuch boughs as will not be beat down muſt be cut off, and thruſt into the body of the buſh in the openeſt places; and ſome other boughs from the hedge may be uſed to thicken it, if there be farther occaſion. Theſe are to be well tied in, and when the ſurface is flat, full, and very rough, let it be laid on the ground again, and two or three good logs of wood tied upon the back to make it firm and heavy.

The harneſs of a ſingle horſe is to be fixed to the end of the ſtem where it was cut off, and thus it is to be drawn over the ground: and it will tear and ſcatter the manure.

This is the buſh harrow of the oldeſt writers, and as it was doubtleſs practiſed from the firſt invention of manuring paſture ground: its improvement brings it nearer the common harrow in form, but the material part is the ſame; for the work is performed by natural buſhes. The method is this.

Lay an old gate upon the ground, that is not rotten, but will hold well together. Cut up a parcel of blackthorns, and take the buſhyeſt and rougheſt of theſe. Draw them in; and work them between and among the bars of the gate, faſtening them by nails, cords, and otherwiſe, till the whole ſurface is well covered, and very rough: then turn it up, and the buſhy part lying to the ground, it is fit for uſe. The traces are to be fixed to the center of the gate, and it is to be dragg'd over the ground. This is more compact than the other, but it is heavier. The bars of the gate ſerve as the wood-work of a harrow, and the buſhes anſwer the purpoſe of teeth. The blackthorn is preferred on this occaſion becauſe it is tougher, and the thorns are harder. It would be better for the other purpoſe, but that it does not grow large enough to be uſed ſingly.

Which of theſe two kinds the farmer ſhould prefer, muſt be determin'd by the manure. The firſt kind is eaſily drawn; the advantage of the other is, that it is heavy and ſtrong. When the manure is of the tenderer ſorts, the firſt is beſt; but when it is tougher, and the clods require more breaking, the other.

Theſe harrows are to have a hook of iron for the faſtening the traces to them by which they are to be drawn; and this ſhould be well fixed on the inſide.

CHAP. XXXIX.

Of the drill harrow.

THIS is a harrow of particular form, and very late invention, but it is of excellent ſervice. The drill huſbandry is one of the greateſt improvements made within this century, and this inſtrument does a part of it.

The method of drilling is this; when the ridges are properly raiſed, and are become moiſt enough at top, they are harrowed lengthwiſe, and then they are drilled. Once is generally ſufficient, but the eye of the farmer is to judge whether it be or not; and, if not, he is to order it to be repeated.

If he find after this, that the tops of the ridges are not levelled fit for the drill to paſs thereon, and reach to the due depth, the ground muſt be harrowed a ſecond or a third time, till it be in a proper condition.

The land being prepared, the drill is to be brought on. This makes channels for the reception of the ſeed; and that theſe may not remain open, the drill harrow follows, and drawing the earth together fills them up.

The harrowing the ridges to prepare for the drill, is to be performed by the common harrow. The drill harrow follows the drill plow, and is of no other uſe than the covering up the ſeed in thoſe trenches wherein it is laid, by this particular method of huſbandry.

It was needful to ſay thus much in this place to explain the operation of this inſtrument, which will be underſtood more fully when we treat of that method: having thus far explained it on the preſent occaſion, we ſhall be underſtood in the deſcription of the inſtrument.

This is exceedingly plain and ſimple. It is never uſed, but to follow the drill plow; and conſiſts only of two beams, by which it is faſtened to the plow; a croſs bar fixed to thoſe two beams, and a couple of wooden teeth let into that bar.

In the common wheat drill plow, the harrow is thus conſtructed.

The legs are a couple of narrow and flat pieces faſtened by a couple of ſtout iron pins, which paſs through the tops of the legs, and the beams of the plow, and are fixed on the outſide by nuts and ſcrews. Theſe pins are ſquare where they paſs through the beams, that they may be held the faſter; but they are to be round near the heads that the harrow may move freely on them. The other end is cut round, and they are let through the croſs bar, which is called the head, by holes made for that purpoſe; and are pinned in behind it, that either tine of the harrow may deſcend at the time the other riſes, where the ground is uneven. The tines are flat pieces of wood, and they are let through the croſs bar at two and twenty inches diſtance from one another. They are to be pinned in above the head; and each is to have a ſhoulder underneath. Theſe are to be ſet ſloping, ſo that if they take hold of any clods, they do not drive them before them, but riſe over them.

They muſt be of ſuch length as to give room for the harrow to ſink and riſe without moving the ſhares; and to give them the more room, the legs of the harrow are to be bent downwards, towards the middle.

By the diſtance allowed to two tines, each tine going three inches and a half on the outſide of each channel that is next it, fills it up with earth upon the ſeed from the outſide. This gives an inch in the two rows diſtance when they riſe; for, as they will come up nearer the inſides becauſe the earth is thrown in nearer the outſide, they will ſtand but fourteen inches aſunder, tho' the channels were made at fifteen inches. The ſloping of the points alſo, which is to be made outwards, brings in ſo much the more earth to the channels.

When this harrow is found to be too light, a ſtone is to be tied to the croſs bar or head, and faſtened evenly upon the middle of it: or a box made of boards, and fitted on in that place it is uſed, which is filled with earth or other weighty materials to keep it ſteady. A triangular harrow with many tines, may alſo be made for uſing between the rows in the horſehoeing huſbandry.

In moſt lands the harrow, which is a part of a drill plow, is ſufficient for covering the ſeeds, but not always: the farmer is not in favour of any new contrivance, to give up the old when they may be uſeful.

There are occaſions on which the common harrow may be well called in to aſſiſt this drill harrow in covering the ſeeds.

In tough ſoils when drilled late, and the earth is moiſt, it will ſtick to the ſhares in great quantities; and not only the motion of the plow is hurt, but the channels will be in part left open by the drill harrow.

It will be beſt in ſuch land to take off the drill harrow from the plow, and truſt to the covering of the ſeeds up in the channels, entirely to the common one.

When the drill harrow is taken off, a man may follow the plow in theſe ſoils with a paddle, or a forked ſtick, to clean the ſheats from this ſtiff dirt. The channels with the ſeed in them, will lie in many parts open, and a common harrow is to be drawn over the ground to cover them. If the farmer chuſe to improve his drill harrow than to employ the other, he may order it in this manner. Let the tines be of iron; and the legs be placed at the end of the plank, remote from the ſheats of the plow. The ſheats may then be cleaned, tho' the harrow be on, and theſe iron tines will not fail to cover the channels.

The drill in this caſe ſhould have only two ſhares, and they ſhould ſtand at about fourteen inches diſtance. The harrow anſwers its purpoſe in ſpite of the inconveniences of the ground.

This is the way of making the drill harrow anſwer on all occaſions; but it is a good method for wheat, to draw a common harrow once over the ground afterwards; for nothing lays it ſo well.

It will be beſt to uſe two harrows coupled together; and they ſhould be of the lighteſt kind. The pole that faſtens them together ſhould be tied in two places, that they may always go level. This is a proper caution for harrowing land in ridges; for otherwiſe the ridges will be too ſharp at the top, and the partitions might lie higher than the rows.

The harrowing of ridges muſt never be croſs-wiſe, unleſs they are to be made level for croſs plowing, in order to lay out the ridges in a breadth different from that they had before.

When the ridges are too high, they may be lowered by this harrowing; and it is not attended with the common miſchief of treading down the ground, for the horſe when he draws two harrows together, treads in the furrow that is between them.

CHAP. XL.

Of rolling.

ROLLING is an old practice of huſbandry. When the uſe of the common roller was not known, they uſed other means to break the clods of earth; and theſe under the name of mallets, or mauls, are employed at this time in many parts of the kingdom. The roller is much more convenient, and ought to be taken into their place.

As harrowing is ſometimes performed before, and ſometimes after ſowing, ſo is rolling; it is ſometimes uſed before, ſometimes after harrowing; and very frequently and properly between the two harrowings of the ground.

Where there are lumps of a dry and brittle earth, the roller anſwers very well. It ſhould be uſed only on ſuch lands; but the huſbandmen of England, for want of making proper diſtinctions, do themſelves great injury.

In barley land the roller not only breaks the clods, but ſmooths and levels the ſurface for mowing.

In the old huſbandry when they had ſown the ground, and harrowed in the ſeed, they uſed to go over it with a great wooden beetle: with this they broke the clods left by the harrow; and when this practice had not divided them ſufficiently, they afterwards took the advantage of the firſt good ſhower, and went over the field again with another kind of beetle, and broke them again. This laſt weapon had a flat piece of board faſten'd in a ſlanting direction to the handle, of about a foot ſquare, and two inches thick. They uſually made it of aſh, and by its blows ſtriking it down and drawing it back, they broke and pulled the remaining lumps to pieces.

Theſe operations are ſupplied by the roller with more convenience and eaſe. But a caution is to be given the huſbandman, that he do not make that hurtful which might be beneficial. When the roller breaks the lumps of earth it anſwers its purpoſe. It does this when it is uſed on proper ſoils, and at proper ſeaſons; but otherwiſe it may take a contrary effect.

When the earth is tender and the ſeaſon dry, the lumps are no way broken better than by the preſſure of the roller: but if the farmer will draw this heavy implement over a piece of land of a tough ſoil, and in a damp condition, he will preſs it into cakes inſtead of breaking the lumps; and this inſtrument will in a manner un-till the land inſtead of tilling it.

This is moſt miſchievous when practiſed after the ſeed is ſown; for, in that caſe, it ſqueezes the ſoil into cakes, which its tender ſhoot will not well be able to pierce; and makes it ſo tough, that the ſmall roots will difficultly make their paſſage.

This is the condition of ſuch land before it is tilled, and the rolling it after ſowing in this manner, does a great deal toward reducing it to the old condition again.

All ſtrong land when it is broken by tillage, is put out of its natural condition; and is, from that time the tillage is ended, ſubſiding and ſaddening into its old ſtate again. This is the huſbandman's misfortune; but he muſt be very blameable if he aſſiſt it.

From this reaſonable account of the nature of tillage, and the effects of rolling, it will be ſeen that the great uſe of this inſtrument is on light dry ſoils; and that its beſt ſervice is when it is uſed in the intervals between one harrowing and another.

For barley land it is very fit to be done after ſowing, rolling with diſcretion, and avoiding theſe errors. Its uſe, in this caſe, is evident; becauſe the ſmoothneſs and levelneſs of the ground makes it fit for mowing: but, in the other caſe, it is a proper inſtrument in the immediate purpoſe of tillage, ſerving to break the clods and divide the ſoil.

This is the great uſe of the roller, and the proper time for it is between the harrowing and the ſecond plowing.

When a piece of land has been plowed once, let it be harrowed: this breaks many of the large pieces, and tears up the clods: then let the roller be drawn over: it will break the reſt in a proper manner, and prepare the land for plowing again. This ſucceſſive uſe of the plow, the harrow, and the roller, is the moſt regular and certain way of breaking and dividing a hard ſoil, and breaking it into a condition to nouriſh the crop.

CHAP. XLI.

Of the ſeveral kinds of rollers.

ROLLERS are of different forms, and materials. Some are ſimple, and others armed with ſpikes, or edges. In gardens they uſe them of ſtone or iron, but in fields they are of wood, except the ſhort roller for horſehoeing huſbandry.

The common roller for the field is made of the trunk of a thick tree. It ſhould be eight foot long, even all the way, and fix'd in a plain frame, in the which it can turn with eaſe, and be drawn by one or more horſes. From the fore part of the frame run a pair of wooden ſhafts, and the hinder horſe is put into theſe for drawing.

That us'd in the horſehoeing huſbandry, is a plain roller alſo, though differing in ſize and materials.

It is made of ſtone, and ſeems of a middle kind, between the garden and the field roller: it is a ſmall ſtone roller, ſet in a two ſhaft frame for the convenience of being drawn by a horſe.

The ſtone is to be a yard long, and two foot ſix inches in diameter. Of this ſoil it generally weighs about eleven hundred weight; ſo that it is capable of preſſing firmly, and is ſo ſhort that it is eaſily managed.

The ſhortneſs ſuits it to the purpoſe of that huſbandry, becauſe it can be drawn in the ſpaces where the common great roller could not come.

The frame is very plain, it conſiſts only of two legs or limbers, through which the axletree comes at each end, and which are joined together by a couple of croſs bars near the ſtone. A couple of pegs are driven in each limber near the point, which ſerves to faſten in the horſe.

The two croſs bars are to be of wood, and they ſhould be ſtrong, and faſtened into the limbers by pins. The end of the axletree of the ſtone muſt not ſtand out beyond the ſurface of the limbers, becauſe they would do miſchief by laying hold of the plant, as this is to be drawn between the rows while growing; and the hinder ends of the limbers ſhould be made to turn a little up for the ſame reaſon.

This muſt never be uſed but in the drieſt weather; becauſe by its weight it is capable of doing more harm than any other kind.

It ſupplies in this ſeaſon the uſe of the plow and harrow, breaking the clods almoſt to powder; ſo that the leaſt rains afterwards diſſolve them.

It is excellent for preparing the ridges for turnips. When the land is in ſuch vaſt lumps at midſummer, that neither the plow nor harrow can touch them, this roller will break them, and the land may be eaſily plowed and harrowed afterwards, ſo as to be made fit for the ſeed.

The ſpiked roller is excellent to ſubdue the ſtubborn land in dry ſummers. When the ground can no other way be got into order for turnips, this followed by the great harrow, are excellent.

In making the edged roller, the only caution is, that he make it heavy enough, and the blades ſtout and ſharp. They will be uſeful on other occaſions, beſide that of burn-baiting: and indeed wherever there is occaſion to cut thro' long and ropy furrows, no inſtrument is ſo proper.

CHAP. XLII.

Of the great advantages of rolling.

HAVING mentioned the ſeveral methods of rolling, we ſhall add the advantages of that inſtrument, all of which are perhaps not ſufficiently attended to any more than the inconveniences.

The miſchief that may attend rolling, is preſſing down and hardening the ground; but there are lands of ſo light and looſe a kind, that this preſſing them may, at a proper ſeaſon, be an advantage to them.

We have mentioned the good, ſheep do to light ſoils, by treading them when put upon them: and theſe when they are of the moſt crumbly kind, are often rendered ſo looſe by the weather, that they cannot afford a ſufficient hold to the roots of the crop. In this caſe the uſe of the roller is excellent, for it preſſes and fixes the ſoil.

This is ſo neceſſary in ſome places, that the farmer, though he work his ſoil ever ſo well, if he omit to roll it, will never get half his crop. Chalks, and the white clayey lands are of this kind; and ſome others.

Barley is the crop they roll the moſt conſtantly; but taking proper opportunities, it is equally ſerviceable to beans, peaſe, and other kinds, not excepting wheat.

It deſtroys inſects, and particularly the ſlug. This creature devours immoderately. Of all crops peaſe are its favourite; and it eats them from their firſt ſhoot, till the time of gathering. The great abundance of this creature is in the beginning of ſpring, eſpecially if the ſeaſon be warm and ſhowery; and its principal time of eating is the morning; as the day riſes it gets into the ground.

This will inform the farmer how he is to deſtroy it. Early ſpring is the ſeaſon for rolling, and he muſt do it while the creature is above the ground.

By this he will deſtroy the enemy of his crop, and make the looſe earth firm for its ſupport.

The time of the ſlug's greateſt abundance, is the beſt ſeaſon for rolling his fields; becauſe his crops are at this time in a condition to bear it, which they will not when they are more grown.

The true ſeaſon for rolling corn is the beginning of April, and the beſt method is to roll that which lies in broad lands twice in a place, beginning at day-break.

In dry and looſe ſoils the roots of corn are parched and burnt up in long draughts; and they will ſuffer greatly by but moderately hot and dry weather while they are young. This looſe earth not cloſing about their roots, gives paſſage to the air and ſun directly to them. The roller preſſes and flats down the ſurface, and puts them into the condition of ſuch as are heavier.

This rolling the earth while the corn is young, has alſo the effect of giving it another dreſſing, for it breaks and preſſes the little lumps of the ſoil to pieces.

In all this the farmer is to take care that he do not, by rolling improperly, do more miſchief than he can poſſibly reap advantage. We have adviſed him againſt rolling tough ſoils, and againſt rolling any in wet weather: and this laſt is ſo needful a caution, even with reſpect to the lighteſt lands, that if he ſhould attempt it he would deſtroy his crop. The feet of the horſes would do incredible miſchief, beſide the action of the roller.

Corn muſt be at a proper growth before the roller is introduced. The leaves muſt be ſtrong, but the ſtalks muſt not be hardened. And though moiſt weather is known to call out the ſlug, the farmer muſt ſtay for ſome that is dry, before he can take this method of killing it.

Wheat in a looſe ſoil, may be rolled in October and November, and in January, February, and March; the winter rolling will prevent the ill effect of froſts, as the ſpring rolling will that of droughts.

Care is to be employed alſo in the rolling of barley. This muſt not be rolled too young, for then the preſſure of every clod will cruſh and deſtroy a leaf, and the roots having little ſtrength, will not be able to renew it: and if it be rolled too late the ſtalks will be broken, and the crop that way ſpoiled.

The prudent farmer will ſee there is not any part of his profeſſion which requires ſo much judgment as the rolling corn lands to advantage. The ſoil, the growth, and the weather, are all to be carefully obſerved: when theſe favour, the benefit of rolling will be very great; but when they do not the miſchief may be greater.

The roller is uſed on paſture ground as well as corn lands, with conſiderable advantage: the ſeaſon for that is March, the earth being then a little moiſt. It cruſhes down worm caſts, ſmall ant-hills, and riſing mole-hills, eſtabliſhing the earth about the roots of the graſs, and making the ſurface level for the ſcythe. There will need no farther caution on this head, but that the roller muſt always be of the heavieſt kind.

BOOK VI. PART IV.

Of the different manners of ſowing.

CHAP. XLIII.

Of ſowing in general.

THE operations of huſbandry are not limited to one time, or to one uſe; but the ſame practice anſwers ſeveral purpoſes, and may be equally proper at different times.

Rolling is perform'd, on ſome occaſions, before the ſeed is ſown, and on others after. In the firſt caſe it ſerves to break and divide the ground; and in the other to deſtroy vermin, to fix the earth to the roots of the plants, and to prepare the ſurface for the ſcythe. 'Tis the ſame with harrowing, which ſerves in one caſe to break and prepare the land for the ſeed, and in the other to cover it.

We might therefore have introduced this article of ſowing either before, or after, thoſe operations; but we have choſen the latter, becauſe thoſe articles being diſpatched, there will be nothing to break in upon the courſe of our method, when we proceed from the ordinary manners of ſowing, to that by the drill huſbandry, which naturally leads to the article of horſehoeing, and thence to the cutting and carrying in of the crop.

We have caution'd the farmer, when he is about to raiſe a plantation, to chuſe properly his ſeeds of the trees: there is as much cauſe to be careful in the choice of ſeed for his arable land: and many of the ſame rules hold good with reſpect to both.

The firſt conſideration is the kind and ſoundneſs of the ſeed.

Let it be had from another land, not the farmer's own, on which it is to be ſown again; and it will be beſt if, with a proper degree of goodneſs, it hath grown upon worſe ground.

Where the ſeed is no way different, and the nature of the land the ſame, it is of great advantage to change it. Thus two farmers at forty or fifty miles diſtance, will mutually find advantage in ſowing each on his land the corn that grows upon the other's.

Seed from a colder climate ſucceeds beſt upon land that lies warmer. The Engliſh farmer will be ſure to find his advantage, if he will get from the northern counties his ſeed for the ſouthern: this is the ſame kind of benefit with that of ſowing ſeed from a poorer on a richer ground: the favourable climate advances it beyond its natural goodneſs.

When a dry ſoil is to be ſown, wet weather ſhould be choſen, if the ſeed be of a nature to bear wet; on the contrary, in moiſt land a dryer ſeaſon is to be prefer'd.

Let the farmer ſow wheat in wet weather. It never is too wet for this purpoſe, when the horſes and inſtruments can go without clogging. On the contrary, let him ſow rye in the dryeſt ſeaſons. This will come up at its proper time, without rain; but wheat, if ſown in a dry ſeaſon, will be ſix weeks, or more, before it appears, if there fall no rains afterward.

In general ſummer corn does beſt when ſown in dry weather: only black oats are an objection; they require a great deal of moiſture.

Wheat not only will lie without ſhooting, when the ſeaſon is dry, at and after the time of ſowing it; but a great deal of the ſeed will be loſt; for while it lies and does not grow, it will be in danger of decaying.

The manner of ſowing differs on many occaſions, ſowing under furrow, is ſowing the corn in the furrow, and plowing a ridge over to cover it; ſometimes they harrow the land, and ſow wheat or rye upon it with a broad caſt, ſome only with a ſingle, and ſome with a double caſt, and then plow it upon an edge in broad lands, when the land is dry. Some plow their land up an edge for broad furrows, and ſow their wheat or rye on it, and then harrow it over. In ſtrong and tough ſoils the ſuperficial methods are beſt, and the method of ſowing under furrow is better in lighter: but theſe, and the other methods of ſowing at random, are very imperfect, and therefore leſs need be ſaid about them. Their faults lead us naturally to that excellent method the drill huſbandry, by which every thing wrong in the uſual way is ſet right; and this we ſhall, according to its merit, treat of at large.

CHAP. XLIV.

Of the depth at which ſeeds are to be ſown.

IN the methods already mentioned, corn is ſown at random. It is ſcattered in an irregular manner, and cover'd afterwards to an uncertain depth.

Corn will grow from one depth better than another, and the more regularly it is ſown the finer it will riſe. The intent of the drill huſbandry is to diſtribute it properly, and to cover it in ſuch a manner as beſt ſuits its growing.

All plants are not to be ſown at the ſame depth, ſome requiring more moiſture and more ſhelter than others: ſome rot at thoſe depths at which others will grow beſt.

Let a trench be cut two foot long, and at one end let it be two foot deep, and at the other terminate at the level of the ground, the bottom all the way riſing in a ſlanting direction. On the bottom of this trench, all the way up, let there be ſcatter'd ſeeds of different kinds, and then let the earth that was dug out be thrown lightly in again, covering the ſeeds every where, and filling the trench up to the level of the ground.

It will be found, by this experiment, that none of the ſeed which the farmer has to do with, will riſe when they are buried at more than nine inches depth. At ſix inches ſome kinds riſe very well, and others ſcatter'd with them not at all; and other ſeeds do not ſhoot, unleſs they be within an inch or two of the ſurface. This is a plain experiment, and there can be no error.

Trials of like kind will alſo ſhew, that ſeeds of the ſame ſpecies may be buried at a greater depth in light, than they may in ſtrong ſoils. And that certain ſeaſons favour the ſhooting of ſeeds more than others.

Warmth and moiſture are the great articles for promoting the growth of ſeeds. The ſame kind buried at a depth ſomewhat too great, will ſhoot and ſucceed if the ſeaſon prove favourable on theſe two accounts, which if it had been dry, eſpecially if cold, would have lain there without growing.

In ſome caſes ſeeds will corrupt and grow mouldy, when they are covered too deep for their ſhooting; but this is not univerſal. Experience ſhews they will lie unhurt in this manner, in ſome ſoils twenty years: ſo that on turning up the earth after that period, and bringing them nearer the ſurface, they grow ſpeedily and well.

It ſeems, that in ſome inſtances, the ſeed of plants will lie longer than this, for in many parts of the iſle of Ely, they never turn up the earth in a ditch bank, but there grows muſtard upon it, although there were none before upon the ground, or in the neighbourhood of the place. The ſame thing I have obſerved about Chelſea, with reſpect to the plant call'd eryſimum, or hedge muſtard. This never fails to ſhoot up where the ſoil has been open'd to about two foot depth. Unqueſtionably the ſeeds of theſe plants have long ſince, by ſome accident, been buried in the earth in theſe places, and they keep good there till removed nearer the ſurface, though they lie too deep for ſhooting. Air is an immediate neceſſary to the growth of ſeeds: it is more required to ſome than others; and none will grow unleſs it can operate in a degree ſuited to its purpoſe.

The huſbandman will find he may preſerve any ſeed for a long time good, by burying it in a proper manner; and he will ſee that every ſeed has a particular depth, in a moderate ſoil, at which it grows beſt. He muſt in his practice conform to this knowledge, varying a little according to the nature of his ground, ſowing deeper than the exact rule in very light, and not quite ſo deep in ſuch as is very tough and ſtrong. The air has a greater effect at the ſame depths in lighter than in heavier ſoils.

When the farmer has this knowledge with reſpect to ſeeds, let him conſider the ſeveral kinds, and examine what depth of covering agrees beſt with each.

To this purpoſe Mr. Tull has propoſed the uſe of gauges, which determine the matter with the moſt perfect exactneſs.

CHAP. XLV.

The practical method of finding the proper depth for ſeeds.

A Seed is to be ſown at that depth from which it will come up moſt favourable: every ſeed has its particular depth for a moderate ſoil; which is to be encreaſed a little in a lighter, and a little diminiſhed in a tougher ground;

ground: and this is the whole conſideration. When a ſeed is ſown at a leſs depth than proper, it is dried up, when at a greater it is buried: if it be much leſs or much greater, it will not grow at all: and if but little on either ſide, it will grow leſs perfectly and beneficially to the farmer, in proportion to the degree of his error.

The gauges for determining the proper depth, are made in this manner. Saw off twelve ſticks, of three inches diameter; bore a hole in each ſtick, and drive into the hole a taper peg. Let the firſt peg be half an inch long, the next an inch, and ſo on; every peg being half an inch longer than the former, ſo that the laſt peg will be ſix inches long.

Dig up well a piece of ground where the crop is to grow.

Let the ſurface be laid even, and let the farmer make twenty holes with his half inch gauge in a row, drawing a packthreak line acroſs the piece of ground for that purpoſe. Let him have ſome choice ſeeds, and put one in each hole. Let him cover them up, without raiſing the earth over them; and ſtick down the gauge at the end of the row. All the ſeeds will be thus buried half an inch deep, and no more, and the gauge being left will be a rule to know it.

In the ſame manner let him uſe the other eleven gauges: after making twenty holes with each, and putting twenty ſeeds in them, let him cover them up, ſticking the gauge at the end of the row, and wait the event.

He will ſee which comes up firſt, which grow beſt, and which do not ſhew themſelves at all. From obſerving which depth there anſwers beſt to that particular ſeed, he will ſee what is the proper depth for ſowing it in his field.

This is the foundation of the drill huſbandry. So ſimple and ſo rational is the original of that excellent improvement.

Let the farmer thus try every kind of ſeed before he ſows it, and knowing its proper depth, let him ſet the drill accordingly. Black oats, when the drill is ſet too deep, will ſcarce come up; and moſt kinds, if ſowed too ſhallow, are injured; a great part of the ſeeds not ſticking root, and thoſe which do, growing poorly.

The danger of ſowing in winter is, letting in the ſeeds too deep, as in the ſummer it is the ſetting them too ſhallow. In tough grounds the great caution is to be us'd againſt going too deep; as in the ſoft and tender ſoils, it is moſt likely to err in ſetting them too near the ſurface.

The farmer who tries the ſeed with his gauges upon the ground where it is to grow, makes himſelf ſecure: and as he can, by properly ſetting his drill, be ſure to let in all the ſeed for his crop at the ſame depth, he will not fail of ſucceſs.

It is beſt to repeat this method for every field: but he who wiſhes to ſpare himſelf that trouble, when he knows by experience the proper depth in one place, may vary a little in others, according as they are of tougher or lighter ſoils.

The ſetting the ſeeds by the gauges, ſerves alſo to inform the farmer exactly of the goodneſs of his ſeed. This is an important point, and difficult to be determined: ſeed corn may have faults that eſcape the eye, and will not be diſcovered by any of the common methods of trial. If it be good there is no reaſon he ſhould ſow more than the neceſſary quantity; if indifferent it is fit he ſow the more of it: he will know what he is to do from the ſucceſs of the ſeeds ſet by his gauge.

Thoſe ſeeds which riſe from the greateſt depth, are not to be ſown at the loweſt they will bear, eſpecially wheat, in a land that has a damp bottom; for in this caſe the wet will chill the firſt roots, and check the growth of the plants.

Some differences alſo are to be obſerved according to the nature of the land, and the manner in which it is laid, whether that be flat or in ridges, as alſo with reſpect to the ſeaſon of ſowing. In all theſe the farmer's reaſon and judgment are to be his guides, no general rule can ſuit every circumſtance. The method of giving directions uſefully, is to lay them down in a middle way; ſuppoſing the ſoil, the ſeaſon, and all other accidents, moderate, neither particularly right, or particularly unfavourable. This is the courſe which we have taken. Having added the reaſons for the practical reader to make needful differences, he will ſee in what caſes he is to vary from the preciſe rule, and in what manner; but as to the degree of variation, that muſt be left to his prudence.

We have every where laid down the beſt precepts to the farmer, but we no where demand his exact adherence to them. The proper end of writing is not to take away the neceſſity of thinking, but to lead men to think, and diſpoſe them into a proper road of it to advantage. Thus, in the preſent work, we deliver firſt the reaſons of what we are about to adviſe; and afterwards give the directions with as much care and punctuality as we are able: but when the farmer has underſtood the one, and conſider'd the other, let him put them in practice, according to the ſituation, nature, and cicumſtances of his own affairs, and of the land he tills.

CHAP. XLVI.

Of the quantity of ſeed to be ſown in the common and drill huſbandry.

THERE remains an important queſtion, with reſpect to ſowing, which is, the quantity of ſeed that in any kind is needful for a certain quantity of ground.

This is of great concern, becauſe the price of the ſeed in ſome kinds is a conſiderable article, and becauſe he may hurt his harveſt, either by ſowing a ſmaller quantity than the ground would be able to maintain, or a greater.

In the uſual way of ſowing by hand, there muſt be great uncertainty. One man's hand will be larger than another's; and yet the handful is a handful among the farmers in ſowing.

The ſeed will be ſometimes larger, and ſometimes ſmaller: this will make a great difference in the number of grains in a handful, and the number is the only proper conſideration in ſowing.

If the field be but indifferently tilled, ſo that the earth lie in clods, and make the ſurface conſiſt of hills and holes, the ſeed corn, though ſcattered ever ſo equally from the hand of the ſower, will run off the ſurface of theſe clods into the holes; ſo that it will lie on the field very unequally: and in the ſame manner the crop will riſe in cluſters in ſome places, and be defective in others. This is a miſerable fault, yet it is natural, and according to the common manner of ſowing univerſal. Thus certain ſpots where the corn riſes, are not able to ſupport ſo many plants as grow on them, and others are vacant which would very well have fed the ſurpluſs. The benefits of the field are as unequally diſtributed among its growths; as thoſe of fortune among mankind: there is enough for all if it were properly diſtributed, but millions ſtarve becauſe it is divided unequally.

This is unavoidable in the common method, but it is perfectly remedied by the drill huſbandry. The ſeed there is ſpread juſt as intended, and the ſpaces left vacant are left as they may be moſt uſeful.

A larger quantity of ſeed than is needful for the crop, is neceſſary in the common method of ſowing, becauſe ſome will be buried too deep, and ſome will be left too near the ſurface for ſhooting. A great deal that lies too naked will be eaten by birds; and upon all theſe conſiderations, reaſon preſcribes to him who will ſow his grain by hand, that he allow a great deal more than would be abſolutely neceſſary for a crop.

This is a great expence if he allows it; and he defrauds himſelf if he denies it: at beſt the whole is an uncertainty. We ſhall teach him, by following the drill huſbandry in a right way, to ſave this unneceſſary charge, always to ſupply his ground properly, and always to diſtribute his ſeed equally.

His field ſhall have as many plants on it as it can ſupport, and theſe ſhall have the advantage of every part of his ſoil. This is all that can be wiſhed: this never can be obtain'd in the uſual way of our old farmers; but however great a thing it may ſeem to promiſe, it will be perfectly fulfilled by the drill huſbandry.

The ſeed by this method is let into trenches; theſe trenches are cut at the diſtance that is found beſt, and the ſeed is covered in them exactly ſo deep as it has before been found to require.

As this covering up of the ſeeds is done with a perfect regularity, every one is ſure to be cover'd, ſo that none is devoured by birds. And finally, the inſtrument lodges in each trench the quantity of ſeed that is proper, and no more.

By means of the drill the ſeeds of all kinds are thus lodged in the earth at proper depths, and out of the way of inſects, for the greateſt devourers of this kind prey near the ſurface. The few who creep to any depth, and devour ſeeds, are the ſources of the only accident to which thoſe ſown in this manner can be liable; ſo that we may, with this ſmall exception, provided the ſeed have been good, anſwer for the growth of every grain.

Here is ſeen the neceſſity of that caution we have before directed in the choice of ſeed corn. As the drill diſtributes only ſo much as is neceſſary, and no more, the utmoſt care ſhould be taken that this be all good: for by ſo much of it as is naught, by juſt ſo much will the quantity be too little for the ground.

Here the ſowing by the gauge comes into the farmer's aſſiſtance.

He has bought his ſeed corn, and he has ſown twenty grains of it in twenty holes, and cover'd them equally. They have all the ſame advantages, let him ſee whether they all come up, or how many are wanting. This will ſhew him the value of his ſeed: and let him proportion the quantity accordingly; allowing ſo much more than what he need to have done if all were good, as will compenſate for the defects at that account.

We do not pretend this is a punctually exact rule; for out of every twenty grains there will not be juſt the ſame number of good and bad; but it comes as near as any rule can; and as near as it need.

The drill huſbandry diſpoſes the ſeeds in rows; and the inſtruments ſuit this practice to the ſeveral occaſions. Thus ſome are diſpoſed in ſingle rows, ſome in double, in ſome three or four rows are ſet together. Between theſe rows there are ſpaces of ſix, ſeven, or eight inches; where there are ſeveral of them; and there are larger intervals between one ſet of rows, and another in this caſe, and between the ſingle rows, when they are ſown ſingle.

It will be found by theſe trials, that ſuppoſing the ſeed of equal goodneſs, much leſs is required in the drill huſbandry than in the common. Not that ſo many plants will not be ſupported upon the ſame ground this way as the other; a great many more will ripen thus than in the common method; becauſe of the regularity: for by the other the wind will diſpoſe the ſeed differently; or the harrow will draw it irregularly in cluſters in ſome places from others. In theſe cluſters, though many plants riſe, few come to good, and the vacant ſpaces are uſeleſs.

In our way the corn grows regularly, therefore one ſtalk does not ſtarve another; and the vacant ſpaces may be tilled while the crop is growing.

A piece of land will ſupport more plants, when they are thus ſet, than it can when they are ſcattered in a random way; and if it raiſe fewer, yet theſe, from the great perfection in their growth, will produce more in their kind, becauſe they are better ſupplied with nouriſhment; for every particle of the ground is made to ſerve for nouriſhment.

Fifty ſeeds laid together in a hole in the place of one, will not produce ſo much as that one, when planted as it ſhould be, and properly nouriſhed. The number ſtarve one another, and none come to good: on the contrary, a ſingle grain of good wheat, properly ſown and encouraged by tilling the earth about its roots while growing, will yield a quantity of ſeed at harveſt time, greater than we dare mention to thoſe who have not try'd ſuch experiments.

In the common way a great deal of the ſeed is buried without hope of recovery, and a great deal is loſt by accidents.

Huſbandmen have never examined with exactneſs, what is the proper quantity of ſeed for land; nor do they make any great difference between the quantity for an acre of rich, and that for an acre of poor ground.

It is to no purpoſe to over-load a poor ſoil; nor is there any worſe practice, than not allowing plants enough to a rich ground.

CHAP. XLVII.

The practice in reſpect of quantity in different places.

IN ſome of our weſtern counties the farmers ſow eight buſhels of barley on an acre. They do not conſider the nature of the ſoil. If it be poor they give it the more dung; if rich the leſs ſerves; and the quantity of ſeed is the ſame.

Their practice is to plow the land only once, then they double dung it, and after this the ſeed is ſcatter'd by hand, and harrowed in.

As the land has lain ſome time after the plowing, and is grown hard, the harrow takes but little effect. In all probability three fourths of the ſeed never gets into the ground, ſo as to grow.

The event is anſwerable. If the ſummer prove dry, the harveſt ſometimes will not yield half the quantity that was ſown: in the moſt favourable ſeaſons they ſeldom get above four quarters to the acre. This is a poor encreaſe; but they go on ſatisfied: labour is cheap, and they live hard; and ſo they live at all they are contented. What a prodigious difference is there between this, and the huſbandry of the new method. In which the ſeed all lies at the ſame depth, and that is the very depth experience has ſhewn to be the moſt favourable to its growth, none is buried, none is expoſed; therefore no allowance in the quantity, is to be made upon thoſe conſiderations. But as the fly will damage ſome ſeeds, and froſts may hurt others, allowance is to be made on thoſe accounts, and no other.

Before the farmer determines his quantity of ſeed corn by the buſhel or the pound, let him examine its ſize, for a great many more ſeeds will go to the ſame weight, or the ſame meaſure, when they are ſmaller, than are requir'd when they are larger. This will deceive in ſowing by the drill, as well as by hand, if care be not taken.

Let the farmer weigh an ounce of the ſeed, and count the number of grains in that quantity; then let him weigh a buſhel, and computing by the number in the ounce, he will come near enough to the number that contains. When the number in a buſhel is obtain'd, they may be proportion'd out by the rule of three, to the ſquare feet in an acre.

This is a certain method of giving the right portion of ſeed to any quantity of ground. But in this the farmer is to conſider at what diſtance he intends the rows ſhall ſtand; if he deſigns to plant in ſingle rows, he is only to conſider what is to be the meaſure of the intervals; if he deſign in double, treble, or more numerous rows, he is to compute what will be the ſpace of the partitions, as well as intervals; for the more rows are planted, the more ſeed will be required.

Let him next examine what is the produce of one middle ſized plant of the annual kind; and what is the produce of the beſt and largeſt of the perennial; for he may aſſure himſelf that a plant of the perennial kind will never fail of being brought to this its utmoſt perfection by the drill huſbandry, connected, as it always ſhould be, with the horſehoeing method.

Let the quantity of ſeed, according to the preceding directions, be proportion'd to the reaſonable products. Perennials are beſt planted in ſingle rows; and moſt of the annual kinds in multiplied rows, two, three, or more, according to their nature; in general the beſt procedure is in treble rows, the rows being ſeven inches diſtant, and the intervals between them five foot.

In many caſes it is worth while ſoon after the plants are up, to thin them to a proper number, leaving the moſt thriving.

Let the farmer ſet ſome rows of the annual kind thicker than others, and ſee in the end whether they anſwer better or worſe.

This is ſending him to experience for his guide. No direction is ſo certain; and the beſt office we can do him is to direct his experience into the proper courſe.

CHAP. XLVIII.

Of the advantages the drill huſbandry receives from the hoe plow.

REASON dictates that the drill ought to diſtribute more or leſs ſeed in each trench, in proportion to the nature of the plant. Let us ſee how we can come at the knowledge on which this is to depend.

The nature of the plant ought to direct at what diſtance the ſeeds ſhould be lodged; for this will be effected by the quantity allowed to the inſtrument: as will be ſeen when we ſpeak of its ſtructure. Let us obſerve what ſpace a healthy plant of that kind, we are about to ſow, occupies in its natural growth: when we know this, we are ſo to fit the drill that it ſhall leave ſuch a ſpace between ſeed and ſeed, ſuppoſing all to be good; or a proportioned ſpace according to the degree of their faults.

We ſhall be ſurpriſed at firſt to ſee a piece of land ſown by the drill, and intended to be horſehoed, becauſe of the great quantity of vacant ſpace. We might take this to be unoccupied land; but we ſhould err, for on obſerving the growth of the plants, we ſhall ſee they acquire a perfection vaſtly greater than thoſe of the ſame kinds in the common method; and this is altogether owing to thoſe ſpaces. Theſe intervals we find therefore do, in reality, furniſh the plants in the rows with nouriſhment.

We find at harveſt every ſingle grain of wheat that has grown well, has produced from twenty to thirty ſtalks; whereas in the common huſbandry, each grain generally produces only two or three. If theſe twenty or thirty additional ſtalks from each grain were diſtributed equally in the intervals, the whole ground would appear well covered. They are nouriſhed as well in the rows, as they would be if thus diſtributed along the vacant ground; and therefore whatever be the appearance, the effect is equal.

Let us next examine the ears. Every one of theſe will be found larger and better fill'd in this than in the common way. Therefore as the number of ſtalks made the growth equal, the goodneſs of the ear will make the produce richer, and the harrowing more abundant.

This is plain reaſoning: it is abſolute fact, therefore why ſhould not the farmer form his practice accordingly.

In the common way of ſowing, the ground ſeems well covered with plants, but as all this number cannot find ſufficient nouriſhment in the ground, and it is in that way impoſſible to ſupply them better by means of tillage, after they are riſen; it follows that a great many of the plants die, and many of the others become weak, none wearing that healthy aſpect which is ſeen in thoſe of the other raiſing.

In this new way all the plants are healthy, and are ſupplied from time to time with nouriſhment, by tillage of the vacant land between. Their roots ſpread into that ground, and they are nouriſhed by the dividing it. The ſtrength and rich produce of theſe, though few in proportion, might well make up for the number of the other ſmall languiſhing and half-nouriſhed plants. Facts eſtabliſh this truth: for upon the faireſt trials, it has been found, that of two pieces of the ſame land, equal in ſize, and alike in every natural reſpect, the one being cultivated in the old way, and the other ſowed by the drill, and horſehoed, the produce of the laſt has been three, four, or five times as great as that of the other.

The benefit of dreſſing land by tillage, while the crop is growing, extends to the very hedges. White thorn will grow four times as faſt thus as in another place, and in an equal number of years will yield four times as much wood. This account has been carried farther in other places, I write what I have ſeen.

This can be owing to nothing but the advantage of ſtirring the ground.

In the hedges within the reach of this tillage, the branches not only grow ſooner to a good ſize, but there are more of them. It is the ſame caſe as with the corn which riſes with more numerous ſtalks.

Plowing about the roots of the hedges muſt cut off a great many of them; and it does the ſame with regard to the corn, for the roots of theſe rows of corn do at firſt ſpread themſelves into a great part of the five foot intervals, and by the aſſiſtance of the hoe entirely. The inſtrument does cut the roots of the corn, and of the ſhrubs in the hedges; but from this there reſults nothing but advantage. The roots of trees are like the imaginary hydra, or the real polype, they grow the more for cutting; and the new ones are more proper to draw nouriſhment than the old. When a root is cut off, a number of new ones are produced from it if it be cover'd by earth, and if that earth be newly dug they ſpread more freely. Thus this cutting of the roots, in the breaking of the ground, does the greateſt good, it gives the plants a thouſand new mouths to feed by, and it ſpreads food before them all.

Thus much it is proper to ſay with reſpect to the great produce of the corn in the drill huſbandry. There are thoſe who drill their ſeeds without uſing the hoe plow, and they ſucceed better than thoſe who follow the old way entirely; but the two methods are naturally connected, and they ſhould not be ſeparated. It is to the effect of the horſehoeing in the intervals, that the vaſt increaſe from the drill huſbandry proceeds.

CHAP. XLIX.

Of changing the ſeed.

WE have mentioned before a thing which it is neceſſary to ſpeak of more largely here; this is, the changing the ſeed, or the ſowing upon a piece of land the ſeed which has grown in another place, rather than what has been obtained from its own crop. We have mentioned the fact, we ſhall here enquire into the reaſons.

Cuſtom ſpeaks ſtrongly for it: and that not of one time or country, but of every place we know, and all times of which we have account. Flax ripens its ſeed very well here, but we import it from Flanders for ſowing; and in France, where every thing favours the growth of that herb, they ſtill import the ſeed from the ſame place whence we have it. When our people have ventured to ſow the ſeed of their own growth, they have but poor advantages, compared with thoſe from the foreign; and the French ſay the ſame.

Many other ſeeds are alſo conſtantly imported from different countries, though they ripen favourably with us in the ſame kinds, and the ſame advantage is found. Our farmers from year to year, in many places, change their ſeed corn, and they ſay they find the ſame benefit. If there were no apparent reaſon, the ſucceſs would be ſufficient to engage the farmer to adhere to the practice. But there are not wanting reaſons which explain it; and we ſhall propoſe them.

With reſpect to importing ſeed of certain plants from particular countries, there may be this reaſon for the advantage, that plants thrive better in ſome climates than in others, and in ſome particular countries. Where they thrive beſt they will ripen their ſeed more perfectly, and many plants will do this much better in their native country, than in any other.

A plant that does not thrive perfectly, will not yield perfect ſeeds, and ſeeds that are not perfect will not give plants that are. Every plant has its country, and there is this reaſon for finding where that is. We thus not only ſee the real benefit that follows this practice; but are directed to puſh it farther, and may thereby improve many other kinds.

Beſide this difference ariſing from the climate in which the ſeeds have grown, they may be altered by the nature of the ſoil in the ſame country, and will be much better having been rais'd on one kind of land, than another. In a poor ſoil plants grow weak and low, they languiſh as they ſtand, and it is very natural to conclude, that as they are altogether weak, the ſeeds are ſo too. Imperfect plants will not produce ſuch perfect ſeeds, as thoſe would which are vigorous in the ſame country.

We have been careful in our directions to the farmer about trees, to chuſe the ſeed cautiouſly himſelf, not to get it by purchaſe. We have adviſed him to gather it from a lively and well-growing tree. Every nurſeryman knows ſeeds from poor trees produce poor ones again: and as this is a fact in the larger productions of this kind, why ſhould it be doubted in the ſmaller.

Mr. Tull adviſes, that the ſeed for any piece of ground ſhould be got from a land ſomewhat richer than itſelf, and from one that is well cultivated. This ſeems to contradict the doctrine of removing trees from a poorer ſoil to a richer in nurſeries; and it might be retorted upon us, that this rule ought to hold in one inſtance as well as another. This ſeems an argument, and the opinion of many is againſt that we have adopted in this place; but upon the whole conſideration it appears, that what this author adviſes is right. 'Tis the firſt ſhoot only that is regarded in corn, for that is an annual plant: this is certain to be ſtronger and bolder, from a ſtronger ſeed: and this is all the concern.

The farmer will hence learn the reaſons for getting his ſeed corn from a better ſoil than his own; but we have obſerved, under the article of ſowing, that it is adviſeable for him to change it alſo merely for the ſake of changing; and even this practice, is not without its foundation in reaſon; nor does it want plain proofs of the advantage.

Weeds are a great trouble to the farmer in his corn lands, and there are ſome which love one ſoil, and ſome another. The ſeeds of ſome of theſe will be mixed among the corn, and therefore, as they will be ſure to thrive on their favourite ſoil, the farmer when he ſows his own corn upon the ground again, lays in a ſtore of them with it. This is prevented by making an exchange with another, who cultivates a different kind of land. There will ariſe a great benefit to both by the exchange, ſuppoſing the corn equal in goodneſs.

Suppoſe one of theſe farmers cultivates a light ſandy ſoil, and the other a tough clayey one. The ſeed corn from the ſandy ſoil is full of the ſeeds of the corn marygold, and theſe being ſown on the ſame ſandy ground, would produce that weed innumerably; but being ſown on clay they come to little. In the ſame manner the ſeeds of thoſe weeds which love a tough clay, being ſown among the ſeed corn on a light ſandy land, ſeldom thrive. Thus each farmer gets rid of a great quantity of weeds by ſowing the corn raiſed by the other: there is no diſadvantage attending the crop itſelf, for wheat is wheat, whether it have grown on clay or in ſand, and it will thrive in either if properly dreſs'd.

Mr. Tull thinks this changing of ſeed will not be neceſſary unleſs for getting of better, becauſe his method of culture deſtroys weeds: it is true the horſehoeing huſbandry does this; but there is no reaſon to ſay we need not change the ſeed, for the production of weeds is not the only miſchief.

The grain of land cultivated by the drill plow and horſehoe, is fairer and finer than that of other ground; but we ſhall not, for that reaſon, adviſe the farmer to ſow it over and over again upon the ſame piece: neither ſhall we adviſe him always to chuſe the fineſt looking and biggeſt grain for ſeed. It is a material circumſtance in the drill huſbandry, that the ſeed be all nearly of the ſame ſize; but it is not needful that it be always large; for the ſoundneſs is a a more material article. We find very ſmall wheat, if ſound and well conditioned, will produce very large and fine plants; and in this there is a plain advantage, for it goes ſo much farther in ſowing, as there are more grains in the buſhel.

CHAP. L.

Of the ſuppoſed change of ſpecies, and of Patney *barley.*

PLANTS of all kinds degenerate on ſoils not agreeable to their natures. They languiſh, whether the climate, or that the ſoil in the ſame climate, make the difference. The imagination of one plant's changing into another, becauſe of the ſoil not agreeing with it, is idle and fooliſh. We no longer believe that wheat can change into rye, nor any of the like tales; but we ſee and know, that a plant which continues the ſame in kind, will be worſe in quality, as the ſoil and climate are leſs ſuited to give it nouriſhment. This is degenerating, and this really happens. A grain of wheat, however managed, will never produce any thing but a ſtalk and ear of wheat; but when it is ſown on a good ſoil, and well cultivated, it will raiſe a great number of ſtalks, all of which ſhall have full ears; whereas, when it is rais'd upon a poor and uncultivated ground, it ſhall have but one, and that worth little.

In the ſame manner that Redi proved the falſity of equivocal generation, may any one ſhew that of the opinion of wheat degenerating into rye, which is equally falſe, though it was at one time as univerſally believed as the other.

People ſaw maggots in meat, as ſoon as it began to ſtink, and they ſuppoſed they were bred from the meat. That ingenious Italian placed ſeveral pieces of meat to ſtink; ſome in open veſſels, and others covered with gauſe; the flies came to the open pots, and laid their eggs upon the meat, from which eggs came maggots, and they turned to flies like their parents; but the flies could not get at the meat that was covered, ſo that corrupted as well as the other, but no maggots bred in it.

The farmer ſows wheat in his field, and he ſees rye riſe amongſt it; he fancies ſome of the grains of wheat produc'd rye: but they were grains of rye among the wheat he ſowed. Let him pick a quantity of grains of wheat out of the ear, and ſow them upon bad ground, the plant will be poor, but they will be all wheat; and let him examine the wheat he buys for ſeed, in places where he is uſed to ſee rye among it, and he will find grains of rye in the parcel.

The whole amounts to this. Seeds of the ſeveral uſeful plants have been brought to their preſent condition by culture:

ture: and the plants which riſe from them will anſwer, in all reſpects, while they are well cultivated alſo, to thoſe which produced them. The cultivation conſiſts in giving them good land, dreſſing it well, and planting them properly: 'twas this raiſed them to their good condition, and this alone can continue them in it. They are poorer in their ſtate of nature, and they will, while they are neglected, be returning to that ſtate again. This is called degenerating; but it is properly returning to their original condition: they grow poorer and worſe, but they never alter in their kind.

The great article that promotes the ſucceſsful growth of plants are two, heat and moiſture. Theſe differ in various climates, and in various ſoils. There may be as much variation of heat between a field of ſand, and another of clay in the ſame county of England, as there is between countries diſtant by many degrees.

The effect of this is plain in what is called the change of kind among our grains.

We talk of Patney barley, otherwiſe call'd Rathripe barley, as if it were of a kind really different from common barley. It is the ſame in ſpecies, but the difference in its growth is very great, and by examining this we ſhall underſtand a great deal of this whole matter.

Patney is a town in Wiltſhire, the fields about which are of a ſandy ſoil. Sands are naturally hot; a parcel of common barley being ſown in theſe fields, will ripen earlier than it would elſewhere: and the ſeed of this crop will keep that virtue three or four generations.

This ſeed, ſo rais'd from a parcel of common barley, is Patney barley, or Rathripe barley. Let it be ſown on a light and tolerably warm ſoil, and it will ripen a fortnight or three weeks ſooner than other barley; and the grain produced from it will have the ſame property for ſo many ſucceſſions.

But let this be ſown upon a clayey and cold land, and it will quickly yield common barley again.

Thus we may, at any time, make Patney barley out of common barley; and make common barley out of Patney barley again.

We ſhall add one caution to the practical farmer, which is, not to ſet ſuch a high value upon this Patney barley as ſome do. The change may be uſeful on particular occaſions, but it is in reality a change for the worſe. Patney barley is ſhorter liv'd than the common; and it is tenderer and weaker. The novelty recommended it, and fancy has kept it in uſe, but thoſe who ſow it, are in general loſers.

If a ſmall froſt happen after the ſowing, it generally deſtroys it: this is not common, becauſe it is ſown late: but it may happen; and the miſchief is great: if it have any check from cold winds, from an early drought, or any other accident, it does not recover as common barley will; and at the beſt, if it be brought to a fair tryal, and a field of common barley, and another of this kind, be ſown on the ſame day, and have equal advantages, the common barley will yield a much larger crop, though it be upon the ground ſomewhat longer.

CHAP. LI.

Of the effect of ſoils on the growth of plants.

THE ſoil in this caſe of Patney barley acts in the ſame manner as a different climate, changing as it were, for a time the nature of the grain; and the ſame may be obſerved of all thoſe other changes which afford the different kinds of ſeed, wheat and other corns, diſtinguiſhed under a great variety of names.

The expoſure may alſo act with the ſoil in this caſe. A ſandy ſoil under a tolerable cover, will ripen any grain ſooner a great deal, than a cold land expoſed to the north. The ſame mountain in the eaſt produces on the ſouth ſide Indian plants, and on the north ſuch as are common to Europe. When we underſtand the nature of theſe changes, we ſhall not be led into the common errors about them, which often miſlead the farmer to his hurt. He who reads to learn, and form his practice according to reaſon, will therefore know how far he is to regard them, and how far to believe thoſe who ſpeak of them. As to theſe leſſer changes, he ſees to what they are owing; and as to thoſe of the varying one kind into another, they are falſe. What we have ſaid of Patney barley may be applied to every other inſtance: though in ſome ſuch a change is more worth his regard than in others; becauſe it is more uſeful.

The flax of Flanders is better than the flax of England: but the ſeed of Flanders flax ſown here, will produce as good flax as there. The ſeed of that crop which has grown from the Flanders ſeed in England, produces a coarſer flax, and its ſeed a worſe ſtill, till we are neceſſitated to make a renewal.

This is owing to the difference of heat and moiſture, not to the earthy matter, which is the immediate nouriſhment. That anſwers for the good growth as well in England as in Flanders, as is ſeen in the firſt crop; but it does not here ariſe to the full perfection of the ſeed: and this is owing to our country not ſuiting it in reſpect of heat and moiſture.

This appears to be the caſe, but perhaps we lay that to the land, which is the fault of our people. Let them examine what is the ſoil on which they raiſe the fineſt flax in Flanders, and what is the management they give it. Let them fix upon the ſame ſoil, and treat it in the ſame manner here, and perhaps there will then be no need to ſend thither for ſeed. At leaſt the ſeed of their flax will hold good through more generations.

We ſhall treat this ſubject more largely hereafter, under the article of flax: here we produce it only as an inſtance of theſe general truths.

It is plain that the nouriſhment of all plants is the ſame, and the only difference is, that ſome ſoils abound with it more than others; and ſome plants, according to their nature drain more than others. There is no plant but will, according to the vigour of its roots, rob ſuch other plants as are near it: and a ſoil which is at one time proper for one kind of growth, will always be fit for it, if kept in the ſame heart by proper dreſſings.

This is contrary to common opinion, but it is not the leſs true: common opinion often errs.

On theſe facts depends that great improvement by the drill and horſehoeing method, which we are about to explain.

We have proved that the matter which nouriſhes all plants is the ſame; therefore, when a piece of ground is exhauſted by wheat, there is no occaſion to ſow it with ſome other kind, ſuppoſing it has nouriſhment for that, although not for wheat. The better courſe is to dreſs it properly, and get it into heart for wheat again. This is eaſily done by the new method, without loſing time by fallowing.

We have ſhewn how, by a proper management, a piece of ground planted with coppice wood, ſhall every year ſupply a felling; and we ſhall ſhew how a piece of ground dedicated to wheat, or any other corn, ſhall furniſh him a good crop every year.

The advantage of changing crops is owing to the quantity of the nouriſhing matter left in the ground by the firſt growth, the quantity required by the next crop, and the benefit by tillage.

This muſt be the caſe, becauſe we ſee that all kinds of plants growing in the ſame ſoil, take in the ſame nouriſhment. Upon this principle we ſuppoſe inſtead of changing the crop, to improve the nature of the ſoil by more tillage; ſo that, inſtead of being in a condition to ſupport only a poor crop, it may be able to nouriſh again one of the beſt kind.

BOOK VI. PART IV.

Of Drill and Horſehoeing Huſbandry.

CHAP. LII.

Of the nature of drill and horſehoeing huſbandry.

DRILL and horſehoeing huſbandry are properly to be treated together, becauſe they never ſucceed ſo well as when they are uſed together. Some have practiſed the drill method alone, and they have found advantage, becauſe of its ſuperior benefit; but they might have had much greater profit by uſing both together. We have informed the farmer ſo fully concerning the nature and growth of vegetables, that he will underſtand the manner in which this huſbandry produces ſuch excellence in all kinds of plants; and we may now proceed to ſhewing diſtinctly and exactly what it is.

Drill huſbandry is the practice of the garden brought into the field; and horſehoeing, is that of the nurſery employed in the ſervice of corn. The practice of the garden is better than that of the field, only more expenſive: there is therefore great merit in bringing it, ſo far as that can be done, into the field: and the ſame is the caſe with the operations of the nurſery.

In the field, corn is ſcattered at random, and cover'd at different depths; in the garden ſeeds are ſet in regular trenches, and allowed to the ſame depth, and that adapted to their natures. In the drill huſbandry the ſame is done in the field. A plow is uſed to this purpoſe, which makes trenches of a proper depth: the ſeeds are ſpread in due quantity in theſe, and covered equally in them, ſo that the practice of the garden is brought into the corn field, only in a more exact manner: and the plowing, ſowing, and harrowing, is all done at once.

When corn is ſown in the common way, there is no meddling with the ground afterwards, becauſe of its irregular growth; ſo that the earth cannot be divided and broken to give it more nouriſhment; nor can weeds be conveniently deſtroyed. But in the drill huſbandry there may be left intervals between the rows, whether they be ſingle or double, and theſe intervals, admitting the proper inſtruments, may be tilled ſo that new nouriſhment will be given to the roots, and weeds will be deſtroy'd; this is the practice of the nurſery; where young trees are planted in rows, with intervals between them; and thoſe intervals are, from time to time, dug up. This deſtroys all weeds, and at the ſame time breaking and dividing the ſoil, ſerves to create, as it were, new nouriſhment.

We have ſhewn in what manner the earth is, by this digging, prepared to give paſſage to roots; and how thoſe roots are multiplied by the cutting them off in the digging; and the advantage ſo well known to attend digging between the rows, ſhews what was there advanced is true.

The ſame effect which digging takes in a nurſery, it will take upon the crop in a field, whether corn, or of whatſoever kind, for the reaſon of the thing is the ſame in both caſes, and what is thus founded on fact will never fail. We ſee here the practice ſo advantageous in the nurſery, brought into the corn field; and ſo well have the inſtruments been contrived by which it is performed, that the ſervice of horſes in drawing them, does as well as the labour of men's hands.

When the two methods of drill and horſehoeing huſbandry are uſed together, the crop is planted regularly, and the ground is tilled while it is growing. The ſeeds are covered to a proper depth, they are proportioned to the quantity of ground, and as they come up the plants are fed by a continual new ſupply from frequent breaking of the ground.

CHAP. LIII.

Of drilling.

DRILLING, is diſpoſing ſeeds regularly in rows, and covering them with a due quantity of earth. We have ſhewn how the juſt depth is to be found with gauges;

and we ſhall deſcribe the inſtrument by which it is performed. We here treat in general of the method.

The drill plow makes channels at regular diſtances, and of proper depths; it ſpreads the ſeeds in thoſe channels, and it covers them up with earth.

The ſeed box is a part of the inſtrument: it performs the office of a hand in ſowing the corn, but in a much better manner; for it numbers out the ſeeds as it receives them, and diſtributes them in the trench with exactneſs.

The diſpoſition of plants in rows, has this benefit, that the crop comes up together, and 'tis ſcarce poſſible weeds can riſe among it. The corn that is ſown riſes in lines, and the weeds in the intervals: however near they ſeldom are exactly in the line. This betrays weeds at once by their place, ſo that they may be taken up while young.

Charlock looks very like the turnip in its firſt riſing; and there are ſeveral kinds of graſs which are like the firſt ſhoots of corn. When theſe riſe among thoſe crops, they muſt ſtand till they are grown up to be diſcover'd; whereas, when the ſeed has been ſown by the drill, we know if any thing riſes out of the line it is not a part of the crop.

The drill huſbandry at once places the ſeeds in ſuch a manner, that they may have the greateſt poſſible advantage; and betrays, at their very firſt ſhooting, thoſe weeds which would have rob'd the crop of part of that nouriſhment.

It makes way for tilling the ground, while the crop is growing upon it, which is a vaſt advantage, and cannot be obtained by any other method.

There is thus an opportunity of deſtroying weeds at any growth, which could not be done if the corn were diſpoſed in any other manner. Thoſe uſeleſs plants which would have exhauſted the nouriſhment, are torn up and buried in the earth, and becoming there, as they rot, a kind of manure, ſupply it with new nouriſhment.

CHAP. LIV.

Of horſehoeing.

THE advantages the earth receives from tillage are of two kinds, the deſtroying of weeds, and the breaking the ſoil. Theſe cannot be obtained by any method ſo perfectly, as by horſehoeing; and therefore horſehoeing huſbandry is preferable to any other.

The plow prepares the ground, but it goes no farther;

for it cannot be uſed in the common way, after the corn is up: but the crop may receive greater benefit from the tillage of the land while it is growing, than in the preparation.

When the earth is well prepared, it is broken and rendered looſe, but from this time it naturally clods together, and grows compact. Plants require more nouriſhment when they are grown, than when they are very young; but in the common practice they have leſs: becauſe the ſoil grows worſe from the time of ſowing. The horſehoe tills the land while the crop is growing; and by that means gives the plants a new ſupply, when they moſt want it.

Plowing and hoeing differ in this no more than by the form or ſhape of the inſtruments: a hoe may anſwer the uſe of a plow in breaking the ground before ſowing; and a plow may be uſed, as it really is in this method, to tear up the weeds while the crop is on the ground. It is in the time of performing it, the work actually differs. As plowing is the preparing land for ſowing of a crop, hoeing is the tilling it when that crop is growing.

If land be tilled ever ſo well before hand, that will not prevent the growth of weeds, for although all roots were deſtroy'd, ſeeds are continually brought by the wind, and the better the land is, the ſurer they will grow.

Thoſe weeds which are moſt troubleſome, have ſeeds winged with down, ſo that they fly to great diſtances. Of theſe kinds are thiſtles, coltsfoot, and others.

No care in tilling beforehand can defend againſt theſe; the fitter it is for the crop, the fitter it is alſo for them: therefore ſomething is needful afterwards. The labour of weeders is expenſive, and in the common way of ſowing they cannot avoid damaging the crop. When the ſeed is drill'd it is eaſy to get between the rows, even with a large inſtrument, the advantage is evident; and the work cheaper.

We ſee the benefit herbs receive from tranſplanting, this ariſes from the cutting off the end of their roots; and placing them among new broken earth. This would be impoſſible in many caſes; for who could think of tranſplanting a crop of corn; but the ſame advantage is given when it is planted in regular rows by the drill, and the earth is plowed up between by the hoe plow.

The advantages of hoeing a garden crop, are very great; and theſe are all communicated to a field of any uſeful growth, by the hoe plow, only in a more perfect manner.

Some who follow the new method rob themſelves of half its benefit, by their fear of ſetting about it with ſpirit. They drill their ſeeds in rows a foot and a half diſtance, and then cut up the earth lightly with a horſe hoe between. This is of the nature of the garden hoeing, and is of great advantage: let it be done properly, and it will be of much greater.

Wheat ſhould be drilled in treble rows, with partitions between each row of ſeven inches, and an interval of five foot between every three rows, and the next three: in this caſe the corn itſelf will prevent the growth of weeds in the partitions, and the ſoil in the intervals may be tilled deep with the hoe plow: the crop will thus be twice as good as in the other way.

CHAP. LV.

Of the benefits of deep hoeing.

THE ſhallow turning up the earth between the near rows, ſerves as hoeing in gardens, aſſiſting the preſent crop, but it has no farther effect; the deep hoeing in the five foot interval, ſerves in the place of fallowing, and will often anſwer the purpoſe of manure; tho' on many occaſions it will be worth his while to aſſiſt the crops by both means.

Hoeing in this deep and perfect manner keeps the earth always moiſt, and diſpoſes it to receive dews and rains. The more land is tilled the more freely it receives theſe, and the more ſerviceable it makes them to the crop. A piece of hard land detains what falls upon it too long; and often this is ſo chilled that it hurts the growth. The fine and well tilled earth, as it receives the rains and dews, diſtributes the wet equally, and as it does double ſervice, it never can do any harm.

Experience confirms the benefit of deep hoeing. If a piece of poor ground be ſown with wheat, when the plants are yellow and ſickly, let a part of the field near them be hoed in this manner, and they will revive immediately, and will continue to thrive in proportion as the practice is continued.

If the farmer expect the full advantage of hoeing, without any injury, he muſt prepare the ground by a thorough tillage beforehand: for when the ground is hard, as it will be when but half tilled, the hoe plow often breaks it up, or cracks it among the rows, if it be carried deep: but when the earth has been put into a good tilth before, there never comes any harm of the deepeſt hoeing, for it all crumbles at the ſurface about the places where it is turned.

For the ſame reaſon that ſtirring the earth is uſeful in affording nouriſhment, the deeper that is perform'd, provided we do not go thro' the good ſoil, the more will be the advantage: for plants ſpread their roots and ſend them down to a certain degree at the ſame time; ſo that the intervals between two rows of corn, by being ſtir'd and broke to eight inches deep, afford a certain proportion of nouriſhment, which the corn would not otherwiſe have had. If the earth be ſtir'd to ſixteen inches deep, provided it be good ſo far down, the plants will receive nouriſhment from it in a double proportion. This is the difference between that ſlight hoeing that is perform'd between the rows of a foot and half diſtance, and the deep hoeing between thoſe where the interval is five or more feet.

This ſhews the propriety of leaving thoſe wide intervals; and all muſt find it to their advantage to have ſuch; but nothing is ſo difficult to conquer as prejudice.

A farmer, when directed to plant wheat in treble rows, likes that; but when we name a five foot interval, he ſtarts at the thought of loſing ſo much ground: but we ſhall ſhew him that there is no way in which the ground does ſo much ſervice, or turns to ſo great account.

The drill plow may be ſo made as to ſow many rows at a time, and thoſe at ſmall diſtances: but this is not the moſt profitable uſe of it. Some who are now introducing the drill huſbandry without horſehoeing, call it an improvement; but they ſhould be better inform'd. It was practiſed long before Mr. Tull, and he gave it up becauſe he found it leſs profitable than the other. Drill huſbandry and horſehoeing huſbandry ſhould never be ſeparated; and to practiſe them to the beſt advantage, the rows that are ſown by the drill ſhould never be too near.

Somes plant thrive beſt in ſingle rows, with large intervals between: others do very well with three or four rows near together, and then a large interval. In this laſt caſe the rows ſhould be ſeven inches diſtant from one another, and the intervals between one ſet and another, conſiderably broad.

When theſe three or four rows riſe up to a ſmall height, they blend at top, and make one broad row together. We call them altogether, a row, and when we ſpeak of the intervals, we mean thoſe between one ſet of theſe rows and another.

Theſe are to be broader or narrower, according to the nature of the plants, the largeſt requiring them broadeſt.

Every row muſt have an empty ſpace at leaſt on one ſide, of two foot and a half broad for the ſmalleſt kinds, and for all corn five foot. Smaller intervals do in gardening, becauſe the hand hoe only is uſed, and does not go deep; but when the hoe plow comes, and cuts up to ſuch a depth, a larger ſpace is required, becauſe the roots of the crop will penetrate farther.

Although there be five foot ſpaces between the rows of wheat in an acre of ground, yet the ſtalks in thoſe rows will be more in number, than there are uſually upon an acre in the common way. And this ſhews that it is an error to imagine there is any real loſs of ground by means of theſe intervals.

If the ears were equal in goodneſs, the crop would be equal, becauſe there are the ſame number one way and another; but they are finer and better filled in the horſehoeing way, and therefore the produce is greater.

When theſe intervals have been horſehoed, the roots penetrate through them. Therefore the crop while it ſeems leſs is really greater than in the other way; and though part of the land ſeems unoccupied, every particle is occupied, for as the roots penetrate through the intervals, they alſo entirely ſpread over or fill them.

Many experiments have been made to determine the loſs or gain by large intervals, and the reſult is, that the larger the intervals to a very conſiderable breadth, the greater is the crop.

In the ſame field wide intervals and narrow have been try'd, both without the aſſiſtance of dung; and in the other part dung has been uſed without hoeing. The reſult of ſuch experiments muſt be concluſive; and it has appeared from theſe, that the dung'd part without hoeing, did not yield a crop nearly equal to the hoed part; and that the hoed part, where the intervals are wideſt, yielded the largeſt. Hoeing is preferable to dung, for it coſts leſs, and produces more; and the wider the ſpaces the more benefit there is from it. Theſe are general facts, but the farmer is not to determine his practice by them in every inſtance. We ſhall, on ſome occaſions, adviſe him to have the intervals moderate, and on others to uſe manure with the hoeing.

CHAP.

CHAP. LVI.

Of the different appearance of crops.

CORN ſown in the common way will make a better appearance at firſt, than that which is drilled; but it declines toward ſummer, as the other advances: and though the ſeed corn have been the ſame, and the land the ſame, the crop from the drilled and horſehoed, as obſerv'd before, will be vaſtly the larger.

When the intervals are wide, they may be horſehoed ſeveral times while the crop is growing: the plow may come pretty near the edges of the rows the firſt time, but not ſo near the ſecond, and ſo on, till for the laſt time it muſt be carry'd only along the middle. The reaſon is, that it would elſe crack the ground too much in the rows, and break off too many of the largeſt roots.

It is to the advantage of plants, that the ſmall roots ſhould be broke off, but when they are grow to a ſize they will receive too much check by breaking off the larger; only the middle of the interval is to be broken up at that time; but even there, there will be ſmall roots, which being broken off by the plow, will ſend out innumerable others into the earth thus prepared to receive them, and give them nouriſhment. So that reaſon ſhews this hoeing only in the middle of the interval vaſtly invigorates the plant.

This practice of hoeing will give more nouriſhment to a crop that has no other aſſiſtance, than the common method by dung; and ſo far is the land from being exhauſted by this method, that the more ſucceſſive crops are planted in a piece of ground, with wide intervals, and well hoed, the more able it is to maintain them. The laſt crop is better than the former, and this without dung, or fallow.

The crop need not be chang'd as in other huſbandry, for in this caſe the ground does not grow poorer, but becomes richer every year.

When ground is prepared by dung, it bears wheat the firſt year, but the next crop muſt be of an inferior kind, becauſe the ſoil is growing worſe. But the ground is growing better continually, by this method of horſehoeing, and conſequently wheat will grow on it every year.

If there were to be any change in fields thus tilled, the firſt crop ſhould be the pooreſt, and the farmer ſhould riſe to better every year, till at laſt he come to wheat; but it may be prepared for wheat at firſt, and will continue fit for it throughout.

The wider the intervals, the more the earth may be divided. There is not room to turn two clean furrows in an interval that is narrower than four foot eight inches. If any one ſhould attempt it in a ſmaller interval, he would throw one of the furrows, if not both, upon the next row. Such plants as grown ſaintfoin, and the like, that can bear to have the earth drawn off of them by harrows, may endure this, but even they will be the worſe for it.

The farmer is to ſuit his practice to his ſituation: let him not therefore be tempted to follow this method againſt all other meaſures, in every ſituation. If he have a dry and brittle land, on a level ſituation, he is beſt ſuited for it, for it is with ſuch ground it beſt agrees. If he have tough heavy clays let him firſt improve them well with ſand, and then uſe the horſehoeing huſbandry; and if he have lands upon the ſteep deſcent of hills, let him then follow the old method; for they are not ſuited to this practice. In common fields, as the cuſtom ſtands at preſent, he cannot well follow this method: but we hope we ſhall ſee this objection daily diminiſh.

This method of huſbandry has been adopted in France, and has been found greatly preferable to the common practice; and as the farmer's profits are ſo low that the rents in moſt places are ill paid, and the farms continually thrown up, is it not greatly to be wiſh'd that an improvement invented in our own country, ſhould alſo be followed in it, while we ſee others enriched by uſing it, and ourſelves impoveriſhed by the common methods? The legiſlature has interfered to introduce broad wheels, how much is it to be wiſh'd, that the ſame could be obtained in reſpect to this practice, the conſequence of which muſt be much more beneficial.

The objection of uſing this improvementt in common fields, holds good againſt any other. We have found the advantage of raiſing what are called the artificial graſſes, ſaintfoin, lucerne, and the like. But this cannot be practiſed in common fields, becauſe people muſt obſerve the ſame turns of plowing and fallowing with others. The interpoſition of the legiſlature is wanted for the encouragement of huſbandry.

Having laid down the advantages of the drill and of the horſehoeing huſbandry, and ſhewn why they ſhould be uſed together, we ſhall explain the inſtruments employed in this practice, and then proceed to the mannner of uſing them..

CHAP. LVII.

Of drill boxes.

IN drill huſbandry an inſtrument is uſed which performs at once the ſeveral operations of opening the trenches, diſpoſing the ſeed, and covering it up. The firſt part is performed by a plow, the ſecond by the drill box and the third by the harrow all united.

The plow has its ſhares diſpoſed to cut the trenches of a proper depth, at regular diſtances, and in a certain number; the drill box lays in the ſeeds, and the harrow covers them. Theſe three parts compoſe one inſtrument. The harrow we have named among the other implements of that title, and we ſhall hereafter treat of it more largely, as alſo of the plow: the preſent buſineſs is to conſider the ſtructure of the middle part, the drill box, which is the material article.

The whole inſtrument conſiſts of the plow and harrow, the ſeed box and hopper: the ſeed box receives the corn from the hopper, and delivers it into the trenches.

The mortiſe is a very material part of this implement, and it differs from a common mortiſe, in that it is impoſſible, from its ſhape, to fit it with a tenon, being narrower above, and ſhorter below; all this will be repreſented in the figures.

A multitude of words might be uſed to deſcribe this, and the other parts of a drill box, but the aſſiſtance of the plates will ſpare them. It is ſufficient if we can convey ſuch an idea of them that the farmer will be able to underſtand them, when we have occaſion to mention them, and the workman to make them, and to compoſe the whole.

This mortiſe being underſtood, we ſhall conſider its uſe in the drill box, and thence the other part of that machine. Let us ſuppoſe it a ſeed box for turnips, it will appear as repreſented in the figure under that name. The reader will there ſee the upper and lower edges, and the manner in which they are placed over one another. We ſhew the top of the mortiſe, and the bottom with the lower edges.

We have repreſented in another figure, this eſſential part, the mortiſe cut through and laid open. It is ſhewn as cut down by its four corners. If the oppoſite ſides and ends were all raiſed up, the mortiſe would be formed. A great deal of care muſt be taken in making this true, for upon that the ſucceſs of the whole inſtrument depends.

We have added after this the mortiſe of a wheat drill, in order to ſhew that very eſſential part the box, or great hole, which being larger is beſt ſhewn in the ſide of that kind. This perforation is the ſection of a cylinder that paſſes through the mortiſe.

We have repreſented in another figure, the tongue of the ſeed box, which in ſome degree reſembles the tongue of the ſound board of an organ; but it differs, as is evident, in ſhape, in ſituation, and in the manner of its being fixed to the mortiſe. The breadth of this tongue muſt be conformed to the breadth of the mortiſe and its bevel. The length of it muſt be ſuch that it will reach lower than juſt to touch the bottom of the great hole.

If the tongue have too much play, the ſeed is apt to be turned out irregularly.

We have next given the figure of the ſteel ſpring in a turnip ſeed box, which ſerves both for a tongue and a ſpring.

The ſetting ſcrew is another very material part of this inſtrument, we have therefore repreſented this plainly and ſeparately. It muſt be of iron, and it is to paſs through the hole in the fore end of the mortiſe.

We have next repreſented a notch of the ſpindle, with its ends near it. And we have next given the fore end of a wheat mortiſe; with its hole through which the ſetting ſcrew is ſcrewed: and after this the hinder end.

Theſe are the principal parts, which the workman will eaſily underſtand; and which we have named and figured; becauſe we ſhall naturally ſpeak of them in the courſe of the work. Having thus repreſented them ſeparate, we have given after them the wheat ſeed box entire, with all its parts and appurtenances: it is there repreſented as ſtanding on its bottom; and the reader will eaſily diſtinguiſh its cover, which ſhould be of braſs, and the tongue hanging upon its axis, the end of the iron ſcrew, and the notches of the ſpindle. This ſpindle is kept from moving endways by wreaths, in the ſame manner as the axis of a wheel-barrow.

We have next repreſented the outſide of one half of the braſs ſeed box: and after that one half of a braſs turnip ſeed box, lying with its inſide uppermoſt; and afterwards the whole. And we have there given the ſpring cover and the ſetting ſcrew ſeparate: we have afterwards ſhewn the counter ſcrew and the braſs ſpindle, in which place we have repreſented the manner of its turning.

In theſe figures we have endeavoured to explain what is meant by the feed box, and its ſeveral parts, as they may be named ſeparately or entire in the ſucceeding chapters. The workman will have a general idea from them, and if he have been accuſtomed to things of that kind, will not find it difficult to execute one from theſe parts ſeen diſtinctly, and the view of the whole. But as the greateſt nicety and delicacy is required in the conſtructing thoſe ſeveral portions, and putting them together; we would adviſe the workman who has never made one, to refer himſelf to the ſeveral cautions and directions given at large by Mr. Tull, in his horſehoeing huſbandry; we write to inform the farmer, not the mechanick, and muſt not treſpaſs too far upon the plan we have laid down to ourſelves in the firſt ſetting out of our work. We cannot, within the compaſs of our intention, expatiate farther on the ſtructure of this inſtrument, but hope the figures, which ſave ſo many words in the deſcription, will be ſufficient for the purpoſes to which they were introduced.

CHAP. LVIII.

Of the wheat drill, and turnip drill.

HAVING deſcribed the ſeed box, we ſhall now ſhew its uſe, and the manner of connecting it with the plow, hopper, and harrow: firſt inſtancing their particular ſtructure as appropriated to the ſowing of wheat.

We have repreſented this inſtrument entire in a figure; where the ſituation of the ſeed box laſt deſcribed, and of the harrow mentioned in a preceeding chapter, are explained to the eye, and their uſes evidently ſhewn.

The plow repreſented there, is calculated for drilling wheat in treble rows. Theſe rows are placed at ſeven inches diſtance, and the harrow which moves on its beams covers the ſeed in the ſame operation.

The plank repreſented in the center of the figure, ſhould be, for this purpoſe, three foot and a half long, eight inches and a half broad, and one inch and a quarter thick. And its upper and under ſurfaces muſt be true planes. The two beams of the plow are to ſtand directly under the plank, and muſt be held up to it by ſcrews with nuts. Theſe are to be two foot four inches long, two inches and three quarters broad, and two inches and a quarter deep.

This plow makes its channels by means of three ſheets, which have their ſhares and trunks. The firſt or foremoſt of theſe ſtands under the middle of the plank, and to ſhew its proper ſtructure we have added a figure of it ſeparately. It is placed obliquely, and pointing forwards in the plow, that it may be out of the way of the funnel. It ſhould be an inch thick on the upper part, but the reſt of it need be no more than the thckneſs of the ſhare. We have repreſented alſo a ſhare lying bottom upwards; alſo ſeparately on one ſide of the trunk, which is a thin plate of iron, and is very well made out of the blade of an old ſcythe; this is to be riveted on to one ſide of the ſheat. And after this the trunk entire, which is formed by this plate, and ſuch another on the oppoſite ſide.

After this we have repreſented ſeparately one of the hinder ſheats.

The figure of this cannot be miſtaken, and its ſituation in the plow is at one of the beams, as the other is at the other. They are both faſtened into the beams by their tenons, which are driven into a mortiſe made for that purpoſe, and faſtened by a pin paſſing through the beam.

The figure will ſhew the workman how to make theſe, but it may be proper to caution him not to make the tenons acroſs the grain of the wood; but to chuſe for this purpoſe a crooked piece of timber.

Theſe things being underſtood, of the parts and their ſtructure, we may continue the conſideration of the plow as repreſented together. The fore ſheat being fixed up at equal diſtance from each end of the plank, and as near as can be to its hinder edges, the funnel has room to ſtand with the fore ſide of its hole to make one ſurface with the back of the ſheat, and the hinder part of the trunk does not reach the edge of the plank. The fore-ſtandard muſt ſtand perpendicular to the plank acroſs the tenon of the ſheat.

The ſtandard being thus cloſe to the fore ſide of the fore hopper, there muſt be ſo much room between it and the hole of the funnel, that the ſeed may drop from the ſeed box into the middle of this hole.

The two hinder ſheats muſt be placed at equal diſtance from the ſides of the beams, and ſo near to their hinder ends, that there may be room to make the funnels in them, and there tenons to come up between their reſpective funnels and ſtandards; theſe ſtandards alſo muſt be ſet perpendicular to the beams. The beams muſt be placed at ſuch diſtance from one another, that the ſhares may be fifteen inches aſunder, from the inſide of one to the outſide of the other; and the ſhares muſt be all parallel to one another, and to the beams.

This being the ſtructure of the drill plow, the channel or trench that is made by the middle, or fore ſhare or ſheat, being at an equal diſtance from the two hinder ſheats, is filled up, and the ſeed is covered in it by them; and the ſeed in the trenches made by the two hinder ſheats, is covered by the harrow, which is faſtened to the beams of the plow, and has two tines placed juſt at a right diſtance for that purpoſe: of this we need not give a farther deſcription. Its figure and ſituation behind the plow repreſent it ſufficiently, and we have had occaſion to deſcribe it before, among the other kinds of harrows.

The funnel riſes two inches at the edges from the ſurface of the plank, and is five inches ſquare at the top; and its hole at the bottom is continued quite through the plank, into the trunk that is underneath; this hole is ſquare. Its opening for wheat and other grain, is to be three quarters of an inch; but when peaſe, oats, or other large ſeeds, it may be made an inch ſquare, and it is to be a little wider at the bottom than the top. The other funnels are to be made exactly like this. They cannot be ſo deep becauſe they are cut in the very beams, but their width at top is encreaſed by adding on each ſide a piece of wood, ſo that they are each an inch and quarter wider than the breadth of the beam. The upper or fore ſide of theſe trenches muſt not riſe ſo ſlanting as the others, becauſe that would bring them too near the tenons of the ſheats.

Acroſs the plank of this plow, near its edges, there lie two pieces of wood; theſe are each eleven inches long, two inches broad, and two thick. They are faſtened by ſcrews and nuts, and ſtand parallel to the other beams. Each of theſe have a double ſtandard or fork, perpendicular to the plank, and by theſe ſtandards the fore hopper is drawn and guided.

Having thus examined the make of the plow itſelf, which could not be ſo well comprehended in a figure, if drawn entire with its hopper, we have repreſented it again in that perfect condition, fully fitted up, and ready for work. In this and the other figure ſeen together, all the parts may be very plainly diſtinguiſhed.

The fore ſtandard, which riſes from the front of the plank, is to be two foot long. Its breadth is to be two inches in the narroweſt part, and it is to be half an inch thick in the thinneſt, and two inches at its ſhoulders above the plank. We have repreſented it ſeparately, and it will be ſo ſeen in what manner it is pinn'd thro' the plank before the funnel. It holds the fore hopper from turning upon the ſpindle. It is put thro' a carrier like that of a door latch, which is nailed on the upper part of the fore ſide of the fore hopper. In this the ſtandard has room to play, or move ſideways, that either wheel may riſe up.

We have repreſented ſeparately alſo a hinder ſtandard, which being placed perpendicularly in the beam, is fixed in a mortiſe, and pinn'd into the beam. It has a ſhoulder behind, another before, and a third on its outſide, and theſe ſerve inſtead of braces to keep it from moving backwards, forwards, or outwards. This is two foot four inches long, two inches broad, and an inch thick.

The two hinder ſtandards are made juſt alike except for their oppoſite ſituation, their uſe is to guide, draw, and hold up the higher hoppers, which are repreſented in the figure where this plow is ſhewn compleat, in their places. They are to ſtand upright, and in the middle of the beams, and at ſuch diſtance before the funnels, that when the fore ſide of the hopper, by its whole length, bears againſt the hinder ſurface of the ſtandards, the ſeed may drop into the middle of both funnels.

The ſhafts are repreſented in both figures, they are to be fix'd down to the plank, each by two ſcrews and nuts, and they are kept at a due diſtance by the croſs bar, which runs from one of them to the other, at a ſmall diſtance from the plank. Theſe ſhafts muſt be ſo placed that the path of the horſe is ſtrait with the center of the plow, and then it will follow in the direct line.

The uſe of the trunks of this inſtrument is for making the channels narrow. Without trunks theſe channels muſt be made with ground wreſts, which ſpreads the ſides of them wide; but theſe trunks make them narrow of whatever depth.

We have repreſented ſeparately one end of a hinder hopper laid open, the middle part is cut out to give a cloſer ſight of the plow and fore hopper. The whole hopper is repreſented alſo ſeparate and entire; as alſo a hopper with its ſtandard, ſpindle, and ſeed box. By theſe figures the entire mechaniſm of this inſtrument will be underſtood. At the bottom is ſeen one end of the ſpindle paſſing through the hopper and feed box.

The bottom board of this hopper, which holds the braſs ſeed box, ſhould be four inches broad, and full half an inch thick. And at each end it muſt be a quarter of an inch longer than the ſeed box. We have alſo repreſented ſeparately the two ſorts of wreaths, which are ſcrewed upon the ſpindle to keep it from moving towards either end, as well as to hold the hoppers in their places, one kind may be made of wood, the other muſt be of braſs, and is greatly preferable in all reſpects.

When the plow is all together, as in the figure where it is repreſented entire, the fore hopper ſhews itſelf very diſtinctly; it is ſeen with its ſeed box ſtanding on the fore funnel: this is larger than the hinder hoppers, but there is no more than the ſame quantity of ſeed to be put into it, when it is uſed.

As to the wheels of this plow, the diameter of the fore ones is to be thirty inches, and that of the hinder ones twenty-two; and their ſpokes are to be made ſtrait, ſo that they are not hollowed in the manner of other wheels.

Thus have we repreſented to the eye this complicated inſtrument, and explained its parts by plain words. A volume might be written upon it; but by this the farmer will underſtand enough of its operations, and the plow-wright of its form.

This is the drill for wheat, and the little variations neceſſary to be made in it for other ſeeds will eaſily be comprehended. However, we have added the figure of the drill plow for turnips, that the general difference may be ſeen. The funnel, ſheat, ſhare, and trunk, which are the eſſential parts for the work, are the ſame as in the wheat drill already deſcribed, with very little variation; and the inſtrument is the leſs complicated, becauſe it is to ſow but one row, not three at a time, as is done in wheat, which made the neceſſity of three hoppers, and, in a manner, of a treble apparatus, which is in this caſe ſingle.

He who underſtands the more complicated kind, will find no difficulty in comprehending every part of this, the prinpal difference of which is, that it is ſingle. The ſhafts in this are to be light, and the bar is to be about three inches diſtant from the plank. The plank ſhould be two foot and an inch long, five inches broad, and an inch and quarter thick; and the two pair of ſtandards placed into the plank, with ſhoulders above, are to be thirteen inches high above it. The beam of the plow is to be two foot two inches and a half long, four inches broad, and two inches thick. The funnel is to be two inches deep, and four inches ſquare at the top. The harrow follows in its place, and the tines are made of wood: and they are to ſtand eight inches aſunder at their points, and ſix inches and a quarter at their upper parts, juſt under the harrow head. The hopper of the turnip drill conſiſts of a box placed into the middle of a carriage, we have repreſented this ſeparate, that its figure may be more diſtinctly underſtood, and afterwards the carriage in the middle of which it is placed. The circles of the wheels of this hopper go five and twenty inches aſunder.

The double ſtandards are uſed on a level, and not otherwiſe. We have therefore added another figure of the turnip drill plow, entire and fit for working without them.

C H A P. LIX.

Of the hoe plow.

THE deſcription of the inſtruments will appear tedious to ſome, and that it will be ſaid, as there are people who know how to make them, why ſhould their parts be enumerated here. Others have beſtowed many ſheets upon them, where we have compriſed what we thought needful in a few pages. But ſomething beſide the bare figures we have thought neceſſary, becauſe we would have every farmer entertain a general knowledge of their nature; and becauſe we otherwiſe ſhould not have been underſtood, when we come to name their parts, in treating of the manner of uſing them.

We have gone through the moſt complicated, and longeſt detail; the reader will give us his farther indulgence while we explain, in very few words, the hoe plow, or horſe-hoe, which is an inſtrument much leſs compounded, and much eaſier underſtood.

We have given a figure of the hoe plow entire, and the reader who is already acquainted with the ſtructure of a common plow, and the names and uſes of its ſeveral parts, will be at no loſs to underſtand this.

The beam and tail are very like thoſe of the common plow. Indeed the reſemblance is great, that the beam of a common plow being cut off, and ſcrewed up to the plank

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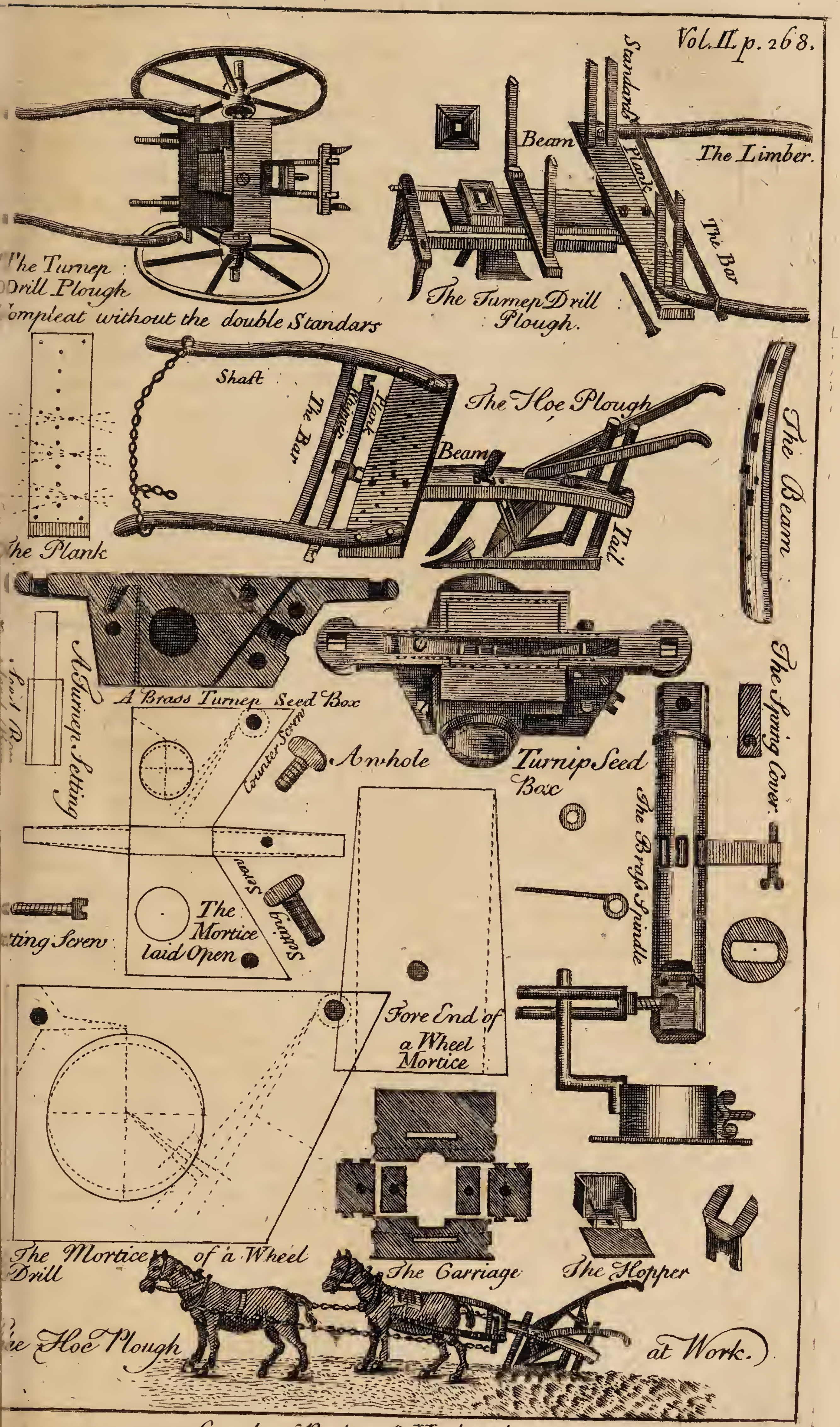

Compleat Body of Husbandry

plank of this, with its ſhafts tight, make a good hoe plow.

But to make a hoe plow perfectly and properly, it is better to ſet about it entire, and for that ſingle purpoſe. The ſhare, from its tail to the fore part of its ſocket, ſhould be two foot and one inch long, and from thence to the end of the point, ten inches and a half: this is the proper meaſure of its under ſide. The length of the plank ſhould be two foot ſeven inches and a half; it ſhould be nine inches broad, and two and a half thick. The ſhafts are to be ſcrew'd to the plank, in the ſame manner with the beam. And the draw pin, whoſe nut is ſeen in the center of the plank, is to have a crook underneath, to which one of the links of the ſhort chain of the whipper is faſtened. The under ſurface of the ſhafts runs on a level with the plank, and they are to crook outwards till they come within a foot of the chain; theſe ſhafts muſt be ſtrong and well made. The notches in the ends of the whipper, ſerve to faſten the traces of the horſes. And the ſhorter the ſhafts are from the bar the better, ſo they are ſufficient in length for their purpoſe.

This plow is a very plain and very excellent inſtrument. It is ſet to go deeper or ſhallower, by changing the links of the chain of the ſhaft which lay hold of the crook. This has the ſame effect in the hoe plow, as the changing the pins to different holes of the crow ſtaves in a common plow. We have repreſented ſeparately the beam, with its mortiſe and holes; and the plank which, by its holes and dotted lines, ſhews the different manner of placing the beam. The four holes near the ends, are for ſcrewing down the ſhafts.

There are uſually nine holes in the plank, for changing this ſituation of the beam, that the plow may follow in a right path. The holder may alſo make ſome alteration in the going of the plow by the handles.

After thus repreſenting the inſtrument, we have ſhewn it at work, where the manner of fixing the horſes is ſeen. This inſtrument being explained, we ſhall enter upon its uſe, together with that of the drills before deſcribed; that is, we ſhall enter on the practice of drill and horſehoeing huſbandry, for the ſervice of which theſe inſtruments have been invented.

BOOK VI. PART VI.

The Benefit of Drill and Horſehoeing Huſbandry, ſhewn in three Sorts of Crops.

CHAP. LX.

Of raiſing turnips by the drill and horſehoeing huſbandry.

WE have laid down the theory of drill and horſehoeing huſbandry, and deſcrib'd the inſtruments; and we ſhall in this and the two ſucceeding chapters, reduce that theory to practice.

We chuſe for inſtances turnips, wheat, and ſaintfoin: the moſt uſeful roots, the moſt valuable corn, and the fineſt of the artificial graſſes.

Each of theſe we ſhall mention ſeparately on this occaſion, and they are to be treated of more generally in a ſucceeding part of our work: they are here conſidered only as inſtances by which to ſhew the practice of this particular huſbandry.

Turnips are diſtinguiſhed by different names, according to their ſhape and colour; the principal ſorts the farmer is to do with are three, the common round turnip, the long, or Suffolk turnip, and the yellow turnip.

Theſe are for the food of cattle; and though it is but of late this root is got generally into the field, the advantage of cultivating it is ſo well known, that there is no article better worth the farmer's regard; and there is nothing in which he may have more benefit from the new huſbandry.

Turnips thrive beſt in a light warm ſoil: and this kind of huſbandry, is on ſuch land beſt practiſed. The common method is to allow two pounds of ſeed to an acre, and to ſprinkle it by hand.

They are ſown at two ſeaſons. In ſpring to produce ſeed the ſame year; and at midſummer for the food of cattle in winter.

Thoſe ſown for ſeed are few. A part of this is uſed for ſowing again, and the reſt is mixed with cole-ſeed to make oil.

For the midſummer ſowing, the land is to be plowed in May, and twyfallowed in June: the ſeed is then to be harrowed in. Thus they are raiſed in the common method, and are ready for the cattle in the depth of winter, and the beginning of ſpring.

This way they are very liable to be devoured by the fly, and the ground is to be often ſown over again.

When they come up too thick, the practice is to thin them with a hand hoe.

This is the common way for raiſing of turnips, but it is ſubject to many inconveniences: we ſhall now ſhew the method by the drill and horſehoe.

That the farmer who ſhall try this method may give it fair play, let him fix upon a proper ſoil. The moſt favourable land is light, ſandy, warm, and a little moiſt. The worſt is chalk; but with good culture they may be raiſed any where. If the ſoil be ſhallow, neither turnips, carrots, nor any other large-rooted plants, will ſucceed well.

When a piece of ground is intended for turnips, it ſhould be firſt plowed up as deep as poſſible, and then thoroughly broken and divided. If the ſoil be light, this will do; but if it be a tough piece of land, other methods are to be uſed; for unleſs it be broke effectually, ſo that it may be kept fine, the turnip will never arrive at perfection.

Thoſe who would have tillage anſwer the place of manures, recommend nothing more than thorough breaking the land by working: we do not write to ſerve a ſyſtem, but to ſerve the farmer. Therefore although we are, in this place, recommending the horſehoeing huſbandry, and propoſing the excellence of it in raiſing of turnips, yet we ſhall adviſe the huſbandman to add, in caſe of a tough ſoil, the benefit of manures.

Let him lay on theſe as has been directed. And when he has thus converted a heavy ſoil into a light one, let him go to work upon it for turnips with the horſehoeing tools.

Suppoſe a farmer has a neceſſity of raiſing turnips, and has nothing but a clayey ſoil: turnips will not thrive upon it, becauſe it is cold and tough. Let him therefore throw on good river ſand: this will make it a kind of loam, in which ſtate it will be lighter and dryer; and when he has made this change, let him go to work and prepare it for his turnips. The horſehoeing huſbandry, with the aſſiſtance of this manure will produce them in great perfection. Whereas it would have done it but poorly without.

Other ſoils have a neceſſity of other manures, and let the farmer act accordingly. Let him firſt improve the ground, and proceed to the preparing it for this particular growth.

The ſucceſs of his turnips will make ample amends for all his trouble and expence.

The ſeaſon of ſowing turnips for winter ſervice, is from the end of May, to the beginning of Auguſt. The warmer the ſoil the later they may be ſown.

The diſadvantage of chalky ſoils for turnips is, that they grow ſlowly: and this, in their firſt ſtage, is deſtructive. The turnip, before it gets its rough leaves, is a prey to many inſects; and as it is longer in chalky ſoils than in others before it gets them, there is the more danger. This plant grows much quicker in the new method than in the old, and therefore it is one of thoſe that have the moſt benefits from it.

Sandy ſoils being warm make turnips grow faſt, and the horſehoeing makes the earth receive the dews plentifully, ſo that they are always in a condition of growing with vigour.

In the new method an ounce of ſeed ſows as much land as a pound in the ordinary way. In that way the turnips riſing at random are, in a great meaſure, to be cut up, but in this all the ſeed that is ſown is for good.

CHAP. LXI.

Of the diſpoſition of a turnip crop.

THE turnip ſhould be ſown by the drill plow in ſingle rows. And the beſt diſtance for theſe rows is ſix feet aſunder. Theſe large intervals will appear a great deal of waſte ground, but the turnips have really the advantage of it all; and they will evidence it by their growth.

Turnips have been tried in double rows, but they do not ſucceed ſo well. Mr. Tull alſo ſowed them in ſingle rows, with three foot intervals, but that did not anſwer. He found a field ſowed thus, produced a much larger quantity of turnips than a neighbouring one of the ſame extent, which was ſown and hoed in the uſual way; but its produce was not comparable to that of the ſingle rows, with ſix foot intervals. When theſe intervals are well wrought by the horſehoe, to a good depth, the plants grow in a ſurpriſing manner, and never ſuffer by drought.

In Languedoc they have only four foot intervals between their rows of vines, and they break the earth between with a hoe plow drawn by oxen. This has led them in that country, where they very much uſe the horſehoeing huſbandry at preſent, to make the intervals among turnips of the ſame breadth: but their turnips, by their own account, have not come up nearly to the ſize and perfection of thoſe raiſed in England.

As the ſeaſon promiſes to be dry or wet, the ſeed ſhould be let into the ground at a greater or leſſer depth. When there follow ſhowers the ſeed will grow, though but juſt covered with mould; but in a dry ſeaſon nothing aſſiſts the ſhooting ſo much as lying at ſome depth, becauſe there the ſeed is in the way of ſome moiſture, that part of the earth never being ſo burnt up as the ſurface.

A great advantage of the drill method is, that the ſeeds may be let into the trenches at different depths, ſo that whatever be the ſeaſon ſome will riſe. When the ſeeds are lodged alternately ſhallower and deeper, if there follow rains, the ſhallow ſeed is the firſt that ſhoots; but if it be dry weather, that is up firſt which lies the deepeſt.

There is a great advantage in having two ſhootings of the turnips in the ſame field: no plant is ſo liable to accidents when young, and by this means, if one crop ſhould be deſtroyed, there is another ſafe, perhaps without the trouble of a freſh ſowing.

The ſame advantage may be obtained by ſowing a mixture of old and new ſeed, for the old is longer before it comes up than the new.

The creature that does the miſchief is a ſmall fly. This comes in innumerable multitudes, and wherever the ſwarm ſettle they eat away down to the root. When they have done this miſchief they go away, and it is perfect chance whether they come again juſt at the riſing of the ſecond crop.

It is only while the turnip is very young that it is liable to this miſchief, and there is no probability that two ſwarms of theſe creatures ſhould come each juſt at the time when there is danger. If they keep away till the rough leaves appear, the crop is ſafe; and this, according to the preſent method, is in a very little time.

When the ſeaſon is favourable, when all the ſeeds have ſhot, and no miſchief has been done by inſects, the number of plants will be too great. And they muſt be thinn'd.

The ſooner this is done the better. The method is to pull up the worſt where they ſtand thick.

The quantity to be pulled up, will be determined by the number that have riſen. The turnips ſhould ſtand at about ten inches diſtance.

When the turnips have ſome bigneſs in leaf, the hoe plow is to be brought in to the intervals. They may be wrought two and two if the crop grow well. This gives them their food from the new broken earth moderately, from time to time, and it is better than to give them a great deal at once, and then leave them a long while without any refreſhment. This alternate plowing of the intervals is beſt for plants, ſowed in ſingle rows. But it does not deſtroy the weeds ſo well as plowing all in a regular manner, and at once. Therefore when weeds are very rank that method is preferable.

CHAP. LXII.

Directions for horſehoeing of turnips.

IT is a great advantage to make the plow come near the rows without damaging them: and this may be done much cloſer when they are young than afterwards; when they are hoe plow'd afterwards, and ſome earth is neceſſarily left near the rows unbroken, a man ſhould be employed to go and turn that by hand, with a hook or ſome other inſtrument, The looſening the reſt of the ground will make this break ſo eaſily, that a good labourer will do a great deal in a day: this is a much better method than to bring the hoe plow near them when large.

For many plants, when drilled in ſingle rows, the method of working the intervals alternately is right, and where the weeds do not make the other method neceſſary, it is very eligible. Two plowings in this manner are only the expence of one, and the benefit is commonly ſufficient. The plant that has abundant nouriſhment from one ſide, may diſpenſe with its being more ſparing on the other; and there are other reaſons yet for this practice. If the plow, by coming very near the plants, have cut and broke too many of their large roots, the hurt is only on one ſide, and thoſe on the other ſide will take in a ſufficient ſupply of nouriſhment, till new ones are puſhed out there in the place of others. The ground being firmer, we may, in that caſe, carry the plow nearer to the turnips without danger of looſening them; and finally, when the crop is large the plow goes more readily to the ſupply of firſt one parcel and then another:

another; and if all have leſs nouriſhment at a time, none are long neglected.

While turnips are ſmall, care muſt be taken that a furrow is not left open near them, becauſe the earth would become too dry; but when they have three months growth, there is no more hazard, becauſe they are grown ſtronger, and the earth naturally becomes more moiſt. When froſts ſet in, the ſame caution ſhould be obſerved, not to leave a furrow open near them.

The ſeaſon in which they are ſowed will, in ſome meaſure, determine whether the intervals are to be plowed alternately or otherwiſe. If the turnips have been ſown late this method will do, but if early the weeds will grow faſt, and the plowing them all in a regular manner will be neceſſary.

It is ſurpriſing to what a bigneſs turnips will grow by this method. Seven or eight pound weight is not an uncommon thing for a whole field, one with another; and in very good land, when the whole practice has been rightly conducted, 'tis common to ſee them of fifteen pound weight ſingly.

The great uſe of field turnips is to ſupply the cattle with food in the depth of winter, and in ſpring, till the graſs gets ſome ſtrength. As they are only pulled up as they are wanted, they often muſt ſtand till the ſeaſon of ſowing corn is advanced too far, or is abſolutely over. This is a reaſonable, and great objection againſt the turnip in the common way, but in this method of the horſehoeing huſbandry it is none. The ground in the intervals may be ſown; the turnips may ſtand, and they will get nothing but advantage from the repeated tillage of the ground between.

The plowing for the ſake of the turnips, keeps the intervals in order, and they may be ſown in the middle with corn in treble rows, at the diſtance of ſeven inches, row from row. There will be ſufficient intervals between them, which when the turnips are all taken up, will be ready for plowing for the nouriſhment of the corn.

Cows are very fond of turnips, and they encreaſe their milk. Sheep alſo eat them greedily, and they are a wholeſome nouriſhment: but ſheep ſhould have them while young, elſe they do not ſo well take to them.

Handhoeing of turnips, is but a poor method at beſt, and it is generally ſlighted over. The hoers, inſtead of breaking all the ground, tear up the ſurface of one half, and draw it over the other, covering the weeds with it, inſtead of hoeing them up: ſo that, inſtead of being deſtroyed, they are only made to grow the ſtronger.

Drilling upon the level was the firſt practice with turnips, but it is a bad way. When they are drilled in ridges the hoe plow may come near the ridges, and go deep without miſchief, but in the other way the young turnips are often buried by the earth falling over on the left ſide of the plow. Turnips planted on ridges, at ſix foot intervals, yield double the quantity with thoſe planted on the level, with three foot intervals.

The beſt method of ſowing by the drill, is to let half the ſeed fall into the bottom of the trench, which is to be four inches deep; and the other half over it, at about half an inch depth, lying upon the earth that has fallen in upon the other: and if half new and half old ſeed be mix'd, and the drilling performed in this manner, there will be no leſs than four different ſhootings: ſo that there will be four chances inſtead of one, for their eſcaping inſects. It is lucky for the farmer, that as turnips are liable to this accident, the ſeed is ſo ſuited to the purpoſe of preventing it. Turnip ſeed will bear to be buried very deep, and come up well; and by this method, there will be new quantities riſing for a fortnight together.

If all theſe chances fail, the young turnips may be hoe plowed when they are in the greateſt danger, which will bury a great part of the inſects; or another row may be drilled in, without doing any thing more to the land.

When the ground has been well prepared, the roller may be uſed with a great deal of ſucceſs, upon a turnip field ſown by the drill. We have mentioned the great advantage from it in deſtroying inſects; and there is no kind that it more perfectly kills than theſe little flies.

The farmer often has recourſe to his roller in the common way of huſbandry, when he ſees there is danger from the fly; but in deſtroying the inſects he ſpoils his crop: for it makes the ground ſo hard, that the turnips cannot thrive in it. But in the drill way there is no danger. The ground may be rolled; for the hoe plow will ſufficiently break it up, and looſen it again. The right method is to roll acroſs the ridges, after it is drilled. The turnips may be after this thinn'd at a ſmall expence, by hand hoes; and the hoe plow will then work wet or dry. If they have been ſtopp'd a little in their growth by the rolling, they will preſently revive and recover after this practice.

CHAP. LXIII.

Of the quantity of ſeed, and advantage of the crop.

THREE ounces of turnip ſeed, or between three or four, is the right quantity for an acre of ground; ſometimes two ounces will do: and in the uſual way, altho' we have mentioned two pound, many uſe three or four.

The farmer may leave the ridges, when the turnips are drill'd in ſingle rows, with ſix foot intervals, higher than he can for double rowed crops; becauſe there will be more earth in the intervals.

When the turnips are planted in ſix foot rows, wheat may be drilled between them; and in the ſame manner turnips may be drilled in between rows of barley and rows of oats. The poorer the land is, the wider ſhould be the interval.

When wheat is ſown between rows of turnips the method is this. At Michaelmas, when the turnips are full grown, a ridge is to be plowed up in the middle of every interval, and the wheat drilled on it: and then the turnips are to be taken up towards ſpring, and carried to the cattle.

In the thinning turnips regard muſt be had to their appearance, and thoſe well growing ones which farmers call maſter turnips, may be left two together, if they happen to ſtand ſo, leaving the greater ſpace on each ſide of them. But if three grow together the middle one ſhould be pulled up.

The beſt inſtrument for breaking the earth left about the edges of the rows by the hoe plow, is the prong hoe; this has commonly two, ſometimes three teeth, and that with three is beſt: but it muſt not be uſed till the turnips are of ſome growth.

When the intervals are hoed alternately, the plow may go deeper and nearer the row, becauſe it is ſupported on the other ſide; but this is only to be done while the plants are ſmall: at that time it is beneficial, but afterwards it would be dangerous. At the laſt hoeing it is a good method to leave a broad deep trench in the middle of each interval.

The crop of turnips has a vaſt advantage when raiſed this way, in that they better bear a dry ſeaſon. The hand hoe does not go deep enough to do any ſervice againſt this accident, which ſpoils many a promiſing crop: but the horſehoe breaks the ſoil to ſuch a depth, that it always keeps moiſt.

We have adviſed the farmer to uſe manures for his land intended for turnips; and even dung is allowed for this crop, by Mr. Tull its great enemy, becauſe dung and tillage together, will divide and break the land in leſs time than tillage alone. This is a very neceſſary article in turnips, becauſe they have ſo ſhort a time to grow.

The ſame miſtake may happen in judging of turnips in ſingle ridges with large ſpaces, as about corn drilled the ſame way; they may ſuppoſe leſs ſtand upon an equal ſpace of ground; but it is eaſy to confute the ſuſpicion by counting. The beſt judges of turnips leave only thirty to a ſquare perch when they have been ſown in the common way, but when they are drilled with intervals of ſix foot, there may be five and forty left upon every perch of ground, and each will be much larger than in the common way. Sixty may be left in a perch, and they will thrive very well; and allowing theſe only at five pounds apiece, they will make a crop of above eighty quarters to an acre.

When turnips are drilled late, upon a poor ground, they will not be able to grow very large, and therefore the greater number is to be left. For the ſame advantages that would, in more time, make a ſmaller number grow big, will ſupport a greater quantity of ſmall ones, and their number will make amends for the want of ſize.

CHAP. LXIV.

Of raiſing wheat by the drill and horſehoeing huſbandry.

WHEAT ſucceeds beſt in treble rows, with ſufficient intervals between one ſet of rows and another. We have ſeen the advantage this method of tillage has, in reſpect of turnips, but its benefit with regard to wheat is greater.

The longer a plant is to remain in the earth the more nouriſhment it will require, and wheat is three times as long in the ground as ſpring corn.

The farmer knows it will want a great deal of nouriſhment, therefore he dungs his land to give it; and never ſows wheat but on ground thus prepared, and well tilled beſide. He thus gives a great fund of nouriſhment, but it is all laid in at once; it would certainly be better to afford it this ſupply at times, as it continued growing. Such repeated aſſiſtance cannot be given it in the common method, but it may in the horſehoeing huſbandry; and therefore this practice is particularly ſuited to that kind of corn.

The earth is prepared for wheat in autumn, in ſpring it wants moſt nouriſhment, for then it begins to ſhoot; but by that time the ground has got almoſt into its original condition again.

When the farmer is preparing his land for wheat in the horſehoeing method, let him take care to free it from graſs. Other weeds may be got out when among the rows; but graſs cannot; and it is ſo pernicious, that one bunch of it will ſpoil a yard of the crop.

The ridges for the drilling of wheat ſhould be ſtrait and equal; the plowmen knows how, by ſetting up a mark, to carry on the line quite ſtrait: and to make theſe ridges even he needs only mark out ſeveral of them, before he begins. If the piece be of ſuch a crooked form, that the ridges cannot be plowed ſtrait the firſt time, it may be proper to drill it upon a level, and all the ridges for the next crop may eaſily be made equal.

Six foot ridges, being in number eleven on the breadth of an acre, they ſhould be made lengthways of the field, unleſs there be ſome reaſon to the contrary: as if it be a hill any thing ſteep. In this caſe they muſt go up and down, whether that carry them lengthwiſe or breadthwiſe of the piece; for if the ridges ſhould go acroſs ſuch a hill, they could not be well horſehoed.

As to the height of the ridges, the nature of the ground makes a difference, but as wheat always ſucceeds beſt when it is dry, a foot may be given for the general height. When they are narrow, and have a deep furrow on each ſide, the water that rains through upon them ſufficiently moiſtens the ground, and runs off without poaching.

The deeper the ſoil is the higher the ridges may be made, and the wetter the land the higher they ought to be. In ſhallow ſoils the ridges cannot be made ſo high, becauſe there would be a deficiency of mould in the intervals. But however high they are made, the tops muſt not be ſo narrow and ſharp for drilling of wheat, as they are for turnips, becauſe the wheat is to ſtand in a treble row; whereas the turnips do beſt in ſingle: and a ſingle row taking up leſs of the breadth, may have more of the ridges depth, becauſe it leaves the interval wider. As there is this difference in the ſowing of wheat by the drill way, ſo there is to be a great deal in the reaping, for the ſtalks are to be cut off cloſe to the ground. This could not be done in the common method, but it may in this, becauſe all the plants riſe in the rows together.

When this is done, and the crop is carried off, if the trench in the middle of each wide interval have been left as deep as it ought by the laſt hoeing, the farmer ſhould take a common plow to the ground, and go as near the ſtubble as he can, and turn two large furrows into the middle of the intervals. This will make a ridge over the place where the trench was.

If the trench have not been left ſo deep as it ſhould be, he is to go firſt in the middle of it with one furrow; which, with two more taken from the ridges, will be three furrows in each interval. This plowing is to be continued as long as dry weather laſts, and then the plowman is to finiſh, by turning the partitions on which the laſt wheat grew, up to the new ridges. This is uſually done at two great furrows: and theſe laſt furrows, which compleat the ridges, may be plowed in wet weather.

Sometimes more furrows will be required to make a ſix foot ridge very high. Thus when the middles of the intervals are very wide and deep, there will require ſix furrows to the whole ridge, and they muſt not be ſmall ones. The ſeaſon alſo makes a difference, for when the fine mould is very dry, a great deal of it will run to the left hand before the plow; and more will run back again, after it is gone paſt.

When ſuch ridges have been made for wheat, and the ſeaſon continues too long dry for ſowing it, and the ſtubble not thrown up, let the farmer plow one deep furrow on the middle of each ridge, and then plow the whole ridge at four furrows more. This will raiſe it very high. This practice ſtirs all the earth of the ridges, and is done at five furrows.

This is an important article in the drill huſbandry, but the farmer may be guided in it with great ſafety by a few general rules. The furrows neceſſary for raiſing of ridges muſt be more or fewer in regard to the bigneſs. Six ſmall furrows may be leſs than four large ones.

'Tis beſt not to plow the ſtubble up to the ridges till juſt before planting; eſpecially in the early plowing, becauſe that will hinder the replowing of the firſt furrows, which, if the ſeaſon continues dry, may be neceſſary. This may be done by opening one furrow in the middle, or by two, and afterwards the ridges are to be rais'd up again. When they are become moiſt enough at top, the old partitions being plowed up to them, they are to be harrowed once lengthwiſe, and then drilled.

The old partitions muſt be plowed up to the new ridges, to ſupport their other earth from falling down with the harrowing and drilling, which would elſe make them level.

The ridges in this way excel common ridges of the ſame height, becauſe, being made upon the open trenches, they conſiſt of new tilled mould from top to bottom.

All other ſorts of grain ſucceed beſt, ſown when the ground is ſo dry, that it can be broke into moſt parts by the plow, but wheat is an exception. Wheat is to ſtand the ſeverity of a winter, and the ground muſt fall cloſer upon it, and it does ſo when ſomewhat wet at the time of the ſowing.

In this method of huſbandry, it is beſt to plow the ground when it is dry; and then let it lie till it become moiſt. But in ſpeaking of this dryneſs and moiſture of the ground, we are to be underſtood in moderation: the land need not be ſo dry as to fly like duſt for the plowing; nor ſhould it be as wet as pap for drilling; but in a moderate way on each ſide.

Wheat is a very particular grain. It is too tender to be ſown in a dry time, as rye may be. It requires the earth to lie firmly about it in winter, to ſupport its roots; and it requires it ſhould be ſoft in ſpring for their paſſage. There is no way to give theſe advantages, like ſowing it by the drill, in earth that has been well broken by the plow, and is become a little moiſt; and afterwards breaking the earth all about the rows in ſpring by horſehoeing.

After rain, when the ground is of a right degree of moiſture for drilling of wheat, let it be harrowed with two light harrows drawn by a horſe, going in a furrow betwixt two ridges. This will be ſufficient in moſt caſes, the furrow being juſt broken to level or ſmooth it for the drill.

If the ground whereon the next crop is to ſtand be plowed dry, the farmer may drill at any time during the ſeaſon for ſowing the kind of wheat he uſes in the common method, but it is better to drill a little earlier than farmers ſow than later. The ſeaſon for ſowing by the drill, may be ſaid to laſt from harveſt to the beginning of November.

When wheat is drilled early leſs ſeed is required than when late, for leſs of it will die in the winter. The farmer is to conſider the nature of his land, in proportioning the quantity. More plants will die in winter on poor than on rich ground, he muſt therefore allow more ſeed to poor land, than he does to rich.

When the farmer has a rich piece of land, and drills it early, he is to uſe leſs ſeed than on any other occaſion; every grain will come up, and very few of the plants will die: and a few plants thriving well will ſend out a multitude of ſtalks, and bear an abundance of ears: ſo that the number of ſeeds is not the great conſideration.

On rich land ſown early by the drill. Four gallons of middle ſized ſeed wheat is ſufficient for an acre. In general, ſix gallons is the beſt quantity. A great deal depends upon ſuiting the quantity to the land and ſeaſon, for if the corn be drilled too thick, it will be in danger of falling, and if too thin it will be ſubject to blights. A little too much, or too little of the ſeed is not ſo very miſchievous, but this happens when it is much wrong either way.

As to the depth; it may be done from half an inch to three inches; but when it is too deep, it is in danger of being eaten off by worms in winter. This it eſcapes if ſhallow, becauſe they do not lie near the ſurface in the ſevere weather.

Juſt when the wheat begins to appear above the ground, let the farmer beware of rooks. They perceive it ſhooting before he ſees it, and that is the time they attack it. Let him keep them off the field for about ten days at this period, and all will be ſafe, the corn will then be exhauſted of its flour, and they will not ſeek it.

The later wheat is drilled the more it is in danger of rooks, for if it be done ſoon after harveſt, while there lies a good deal of looſe corn about the ground, they will not trouble themſelves to ſeek that which is buried.

CHAP. LXV.

Of the number of rows for wheat.

WE now come to a very material conſideration; which is, the number of rows that are to be allowed to the intervals for wheat.

The drill may be made to ſow in ſingle, double, treble, or in more numerous rows. In turnips the ſingle row is preferable; but in wheat, that point is not ſo well determined.

Some have ſown wheat in a ſingle row, and left the full interval for horſehoeing between; others have drilled it in multitudes of rows, with few or no intervals of any ſpace; but theſe are the extremes, and are equally wrong. In the make of the drill plow for wheat we have contrived for the ſowing it in three rows, which is a very good method; but ſome prefer only two rows.

One of theſe two methods the farmer is to prefer, whether it ſhall be that by the double, or by the treble row, he muſt determine from the nature of his ground. If he drill in treble rows, the partitions muſt be ſeven inches; if in double, they ſhould be ten.

Where there is only a double row, the weeds are eaſier deſtroyed between; but in the treble rows there ariſe fewer. In treble rows weeds are not ſo eaſily rooted up, without damaging the corn; in the double rows there is leſs hazard; if the ground be very liable to weeds, it will be beſt to ſow in double rows; if it be naturally pretty free from them, it will be beſt in treble. This we mean by adviſing him to conduct himſelf according to the circumſtances of his farm.

In favour of the double-row way, it is farther to be obſerved, that the hand hoe cannot work near ſo efficaciouſly in two ſeven inch partitions as in one of ten inches: and the quantity of earth to be wrought by the horſe hoe, is more when there is only a double, than when there is a treble row.

A leſs depth of mould on the ridge will do for the double than for the treble row.

Six foot ridges are neceſſary to the treble rows, but not to double, becauſe the partitions between the two can be very well clear'd, and wrought by the hand hoe; and the earth of the intervals is wrought with much more eaſe and convenience: and in deep and rich land theſe intervals between double rows may be much narrower than they can be made with prudence in poor. The wideſt intervals of all are required for treble rows of wheat in poor land; in other reſpects the richer and deeper the ſoil, the leſs will do between the rows.

The management of the hoe plow is a great article; and the farmer muſt take care he employs an expert ſervant. The intervals ſhould never be too wide to be horſehoed at two furrows, without leaving any part unplowed in the middle of them; and the farmer will find, that by making the plank of this plow ſhort, and the ſhafts crooked, ſo far as each will bear, he will be able to hoe with it in narrower intervals than he may imagine, without damaging the wheat.

When the double row is uſed, there may be fourteen ridges in an acre; there will then be only one partition on each that is between the two rows; and its breadth is ten inches.

This method brings the new huſbandry nearer to the old: and as we ſhall adviſe the farmer, to come as near as he can toward uniting them, we ſhall direct him to harrow the land, after drilling, with the common harrow; it will cover any of the ſeeds that may chance to have been left bare by the drill harrow.

Hand hoeing between theſe double rows is eaſy; but let the farmer ſee that it is done properly, and not ſlighted over: the earth muſt never be turned toward the wheat; for it may cruſh it while young and tender, and the partition would never be hoed clean.

The hoes for this uſe ſhould have the edge ſeven inches long, and be four inches deep from the handle; they muſt be thin, and well ſteel'd; and this work, at a moderate price of labour, may be done at about eighteen pence an acre, the working people finding their own tools.

For the wheat that is drilled in three rows, four inch hoes are more convenient.

In low ridges, when there are three rows, the middle one is poor; in high ridges it is as good as the others; but the queſtion remains, whether it is not rich at their expence: perhaps as much is loſt in them as is gained in that. Mr. Tull became of this opinion, and changed at laſt his method from the treble row to the double. Whether or not he was in the right we would have the farmer find by trials on different kinds of land.

Peaſe may be drilled by the ſame drill as the wheat, when it is made for the double row, only the ſpindle ſhould be changed for one that has the notches a little bigger. This method for peaſe is preferable to any other, becauſe the earth may be thrown ſo far upon the peaſe in the ſecond horſehoeing, that the two rows will become one, which is very convenient. If barley be drilled, the three row method is preferable; but this is not proper to be followed by a crop of wheat, without a fallow. There is the ſame objection againſt oats; becauſe ſome of their ſcattered ſeeds will live out the winter, riſe among the wheat, and hurt the ſale.

CHAP. LXVI.

Of the manner of horſehoeing of wheat.

THE firſt horſehoeing for wheat is to be performed by turning a furrow from the row; and when the weather is wet when this is performed, the plow may go nearer the row, without miſchief; when dryer, it muſt be carried ſomewhat more diſtant.

As to the time, it is beſt when the wheat has three or four blades: but it ſhould never be done till it have more than one. If the crop have been drilled early, this muſt be done before, or in the beginning of winter, according to the condition of the blade; but when it has been drilled very late, it need not have the firſt hoeing till ſpring. Let the farmer have a ſtrict eye upon thoſe he employs, let him ſee they go as near the rows as they can, without damaging the corn; and as deep as they can, without going below the good ſoil.

If upon looking over the ground, he finds that the firſt furrow was not near enough the rows, nor deep enough, let him order a ſecond to be plowed at the bottom of the former; and if this cannot be conveniently done ſoon after the firſt hoeing, let it be done before the ridge is turned back in the ſpring. Let the farmer remember always to have the furrows turned up, to make ridges in the middle of intervals, during winter.

Let him not be afraid of expoſing his rows of corn to froſts, by hoeing off the earth from them in the beginning of winter; for it is found by experience, that when the hoe has gone neareſt, the plants thrive beſt.

The row in this caſe ſtands, as it were, upon the brink of a perpendicular ditch, and the water therefore runs off from it; and we know dry earth is not affected by froſts like wet. The plants are thus preſerved during winter; and in ſpring the ridge from the middle of the interval is thrown upon them, which is full of new nouriſhment, having lain all this time in the manner of a fallow, unexhauſted.

As ſoon as the froſts are paſt, and the weather will allow it, let the intervals have their ſecond turning: this is called the ſpring hoeing. The ridge from the middle of the interval is then to be thrown to the rows on each ſide, by two furrows, as near as can be done without covering the wheat.

After this the farmer is to be guided by the nature of the land, and by the weather. He is never to let weeds grow to any height in the intervals; and never to let any unmoved earth lie in the middle of the intervals long enough to grow hard.

He will be thus guided in his work during ſummer; and theſe rules direct how many hoeings the intervals are to have. Only let him obſerve, that he muſt never plow deep near the rows in ſummer, when the plants are grown large; but, at the ſame time, let him take care to plow as deep in the middle of the intervals as the ſoil will allow; and let him turn the earth towards the wheat: eſpecially at the laſt hoeing, ſo as to leave a deep and wide trench in the middle of each interval.

The ſtalks, inſtead of two or three, are thirty or forty from each grain; and whereas a great part in the common huſbandry do not come to ear; and of thoſe that do, a great many have ears very ill filled, with the advantage of horſehoeing, all the ſtalks come to ear, and every ear is full of good grain.

There is no way of producing a full grain like late horſehoeing. If this be done juſt when the wheat is gone out of bloſſom, the whole ſtock of nouriſhment is carried up to the grain, and the crop will be doubled.

By theſe means the horſehoeing huſbandry produces a greater crop than the common, from a tenth part of the plants; for it encreaſes the number of ſtalks; it carries them all up into ear; it makes the ear large; and the grain plump, and full of flour. Fourſcore ears have been counted upon one plant; and there have been numbered a hundred grains in one ear. If the wheat plant be capable of this vaſt increaſe and product, there is an ample field for the improvement that may be made by any method of huſdandry, which ſhall better than the others promote its growth.

CHAP. LXVII.

Of the immediate benefit of the broad intervals.

FARMERS are averſe to broad intervals, and the prejudice is very natural: it ſeems leaving ſo much of their land unoccupied. We have ſhewn this is a miſtake; and it is here we may moſt abundantly prove it, arguing from experience.

A plant of wheat is capable of a vaſt encreaſe; and this is to be promoted by giving more nouriſhment. There are two ways of doing this, the one by making the earth richer, and the other by allowing more compaſs of it for the roots. The firſt is by adding dung and other manures; the other by leaving theſe broad intervals, and tilling them with the hoe plow. The latter method will ſucceed much better without the former, than the former can without that; but they will have their fineſt effect when uſed together.

To ſhew the advantage in its faireſt light, we will at preſent conſider the horſehoeing method; with its wide intervals alone, and without any addition.

We can, by allowing wide intervals between double or treble rows of wheat, produce a good crop with leſs labour and leſs ſeed than are needful in the common way, and without the expence of dung, or the loſs of time in fallowing. Theſe are plain advantages; and there is no difficulty in the practice.

If it be ſuppoſed the roots of wheat do not extend ſo far as half way of theſe broad intervals, we have ſhewn that it is aſſerted upon conjecture, and is moſt likely to be an error; and even if it were true, it would amount to no objection of weight: for this breadth is abſolutely neceſſary for the working of the proper inſtruments; and at the laſt hoeing the earth is thrown on each ſide toward the rows, and a vacant ſpace left in the middle of the interval, ſo that they certainly then have the benefit of it all, and that is the time when they moſt want it. There is then no part of the earth of the interval diſtant above ſeventeen inches in the double rows from the plants, or above two foot from the middle rows, when there are three. Thus far the roots of corn may be proved to reach, and the earth in giving them new tilled, and full of nouriſhment for the feeding the ear.

In deep land the intervals may be narrower than in ſhallower; but ſtill they muſt be wide enough for the inſtruments to work: and if in ſhallow lands they ſhould be narrow, there would not only want room, but of earth to work upon.

Horſehoeing will ſupply the place of fallowing and of dung; but there muſt be earth for it to work upon: there muſt be a ſufficient breadth of interval, and a ſufficient depth;

depth: if the intervals be ſo narrow that nearly all the earth of them goes to make the tops of the ridges, there will not be enough to ſupport the plants, let it be ever ſo much improved by tillage. There muſt be quantity of land as well as quality, and as land is cheaper than manure, why ſhould not the farmer allow it.

Weeds are apt to grow in the intervals that are hoed, but they are ſoon deſtroyed. They grow readily becauſe the earth is improved by tillage; but as they are deſtroyed before they come to ſeed, by the repeated plowing, the damage is nothing. The ground is not ſtocked with freſh ſupplies of them, and they even had the benefit of a manure by rotting in the ground.

We ſee the drill and horſehoeing huſbandry produce larger crops in the ſame piece of ground, than the common, and at leſs expence; and this advantage ariſes from the breaking and dividing of the ground in the intervals with the hoe plow. They cannot ſupply the rows ſufficiently, if there be not ſubſtance or quantity of earth to work upon. The advantage is certain, and the neceſſity of breadth in the intervals is ſo plain, that at the ſame time we expreſs our wiſhes that every farmer would give the practice a tryal, we hope none will attempt it without giving the due compaſs, becauſe that would not be fair; and the importance is enough to beſpeak candour in the experiment.

CHAP. LXVIII.

Of raiſing ſaintfoin by the drill and horſehoeing huſbandry.

WE ſhall hereafter conſider the nature and qualities of ſaintfoin: we have here given the culture of it by the drill and horſehoeing huſbandry, as an inſtance of the benefit of that practice.

The great advantage of ſaintfoin is the length of its roots. This pierces to a vaſt depth in the earth, and will ſupport a large growth of it, where the natural graſs would be little.

The drieſt and pooreſt ground may, by a proper management, be made to produce good ſaintfoin, but the fineſt and beſt will always be had from the beſt ſoil.

When the farmer is about to raiſe ſaintfoin, let him prepare his land well, and lay in the ſeed carefully, otherwiſe little will grow.

The depth at which the ſeed is drilled, is a material conſideration. In moderate land it ſhould be covered half an inch, and in ſuch as is very dry and light a little deeper, but nothing is ſo dangerous as the burying it too low in the ground. If it ſhould be left naked upon the ground, it would not ſhoot at all, or periſh when it had juſt ſhot.

The quantity of ſeed to be ſowed by the drill, is about a buſhel to an acre. This allows twenty ſeeds, or thereabout, to each ſquare foot of the ground.

Let the farmer be careful in the buying his ſeed. It is often bad, and then his ground will be underſtocked with plants.

The ſeaſon for drilling ſaintfoin is early in the ſpring. It is a common practice to ſow it in the beginning of winter, but that is very bad; and to ſow it in the heat and drought of ſummer is worſe.

Laſtly, in order to have a good growth ſow it alone. It is a common practice to ſow it with barley or oats, and this is wrong: ſome ſow it with clover or rye-graſs, and that is worſe; it never ſucceeds perfectly, unleſs when it is let into the ground without mixture.

The farmer who is uſed to ſowing ſaintfoin in the common way, will be ſurpriſed at what is here ſaid, with reſpect to the quantity of the ſeed. Six or ſeven buſhels to an acre is the common allowance; but in the ſingle buſhel in this method, we compute for a great deal of bad, for a much ſmaller quantity of plants than would be thus rais'd from good ſeed will be ſufficient. No crop ſo well bears to riſe thin as ſaintfoin, for it grows larger and ſends out more branches in proportion as it ſtands more ſingle.

When ſaintfoin ſtands the moſt ſingle, in moderation, it will yield the largeſt crop. It ſpreads its roots to a great depth and diſtance, and a few well nouriſhed plants are more than a great many that are but half fed. The common length of the ſtalks is two foot or a little more; but when it ſtands far aſunder they will grow to ſix foot.

The root is found to encreaſe in length and thickneſs, in proportion as it is farther from other plants; and as the root encreaſes the ſtalks keep encreaſing. The greater the number of plants there are upon a piece of ground, the ſmaller they are; and their number never makes amends for this deficiency in their growth. When there are but a few plants, they will ſupport themſelves without aſſiſtance, and encreaſe every year in ſtrength and produce; while on the other hand, the great number that are ſometime raiſed by unſkilful people, while they produce leſs, require manure or they will periſh.

From the nicety required in laying in the ſeed of saintfoin, it is eaſy to ſee the drill huſbandry is better ſuited to it than the common; but here is another reaſon: if the plants ſtand too thick they are ſtarved, and yield little; but in this new method they are in leſs danger of this, becauſe they are ſure of having room on both ſides, though they ſtand cloſe in the rows; if the intervals be allowed a due breadth: and there is no crop which requires to have them larger.

When this plant is kept at a due diſtance, the ſecond crop riſes immediately after cutting: but when they ſtand thick it does not ſhoot till there comes rain. A moderate diſtance is leaving about a hundred plants on a ſquare perch, and theſe will very well yield two ton to an acre.

If the farmer drill his ſaintfoin ſeed early in ſpring, and hoe it well afterwards, he will if the ſeaſon be favourable, have a crop the firſt ſummer; this he is not to expect in the common method: the roots having time to ſtrengthen themſelves in the earth, by this early taking off the head, will thrive the better for the ſucceeding years.

On many lands, in the common way, ſaintfoin yields but one mowing crop in a year; but with right management it will yield two very large ones.

No plant has more advantage from hoeing than this. A quantity of hoed ſaintfoin will grow more in a fortnight, than ſuch as is unhoed on the ſame land in ſix weeks; and that which is hoed will be freſh, green, and ſtrong, while the other is poor and yellow.

CHAP. LXIX.

Of the manner of planting ſaintfoin.

THE beſt method is to drill it in double rows, with eight inch partitions, and with intervals of two foot and an half: theſe intervals are afterwards to be hoed only alternately, leaving the other to make the hay upon. The benefit of horſehoeing is evident in this plant, for it makes it thrive exceſſively on very poor land; and will cauſe it to yield two good crops, where it would otherwiſe have afforded but one, and that indifferent.

Leſs horſehoeing is required for ſaintfoin, than for any other plant, in very good land it may be omitted for two or three years, but when the ground is poorer it muſt be repeated oftener; and whenever the crop is ſeen to fade, this will refreſh it. While the plants are ſmall, care muſt be taken not to cover them with the plow, but afterwards there is no danger.

We have ſaid the land muſt be well prepared for this plant: and care is to be taken in the whole raiſing it. The ground muſt be made clear of all other growths, and well broke; and care muſt be taken that the tines of the drill harrow exactly follow the ſhares, for the covering the ſeed.

No other harrow is to come on after ſaintfoin is ſowed: nor is it to be rolled. But thoſe who ſow it with barley muſt roll the ground for the ſake of that corn. No cattle muſt come near when it is young, and in the firſt winter give it a little manure of ſoot or aſhes.

The expence of drilling is hardly a twentieth part of that in ſowing it the other way, and the profit of the crop is generally double.

Leſs horſehoeing is neceſſary to ſaintfoin than any other crop; this plant will ſucceed extreamly well by the drilling, without horſehoeing. It may be ſown for handhoeing, or for ſtanding without any hoeing at all; but the drilling is vaſtly preferable to the method of ſcattering in the ſeeds.

When drill'd for handhoeing, let the rows be made ſixteen inches aſunder; and the plants ſingled out by the hoer to about eight inches diſtance; but let the hoers take care to leave the ſtouteſt and beſt growing plants.

When it is not intended to be hoed, the beſt method is to plant ſingle rows, at eight inches diſtance, with no greater quantity of ſeed than when they are planted at ſixteen inches. Either way there will be a profitable crop; but the horſehoeing and the drill together produce the richeſt, and the moſt laſting encreaſe.

CHAP. LXX.

Of the great advantages of the drill and horſehoeing huſbandry.

WE have in a plain and impartial manner laid down the principles of the new method of huſbandry; the manner in which it is to be performed; and its effects on three different kinds of crops. The farmer muſt by this time underſtand its nature, and it may be proper to cloſe the account with a ſhort recital of its advantages.

The farmer, when he counts his propoſed gain, ſhould conſider four things; the expence of his crop, the value of it, the certainty or hazard, and the condition of the land after it.

If the profit of a crop were to be computed ſingly from its price at market, that of the drill and horſehoeing huſbandry would have the preference over that raiſed by the common method: but the expence alſo is greatly leſs.

The farmer may get more by a ſmall crop that coſts little, than by a larger that he has been at a great charge to raiſe; but in this conſideration he has both the advantages.

Seed, tillage, drilling, weeding, and reaping, with the leſſer articles in this method, do not amount to above the eighth part of the expence in the common way: therefore, were the crop much leſs, the profit would ſtill be greatly above that of the other.

When the farmer ſhall conſider the goodneſs of a crop, conſiſting in the quality, as well as quantity of the grain, he will ſee this advantage in a farther light; for he will find that wheat may be raiſed continually upon the ſame land, and that the grain will this way exceed, in every reſpect, that produced by the other huſbandry. Not only land will continue to bear wheat every year, but it will grow on land that would not otherwiſe have yielded it at all, without an expence of manure more than equal to the profit by the crop. In this way of managing land it will yield good crops, from year to year, with no manure at all; and if a ſmall expence be added for manure, the ſucceſs will be ſurpriſing.

The certainty of a crop by this new method is much greater than in the old. In the common way he often ſuffers by the ear being too ſmall, by the want of quantity, and often from its being too large, by the falling. But in the new huſbandry the ears are never too ſmall, and they are much leſs liable to lodge, becauſe the ſtalks are ſtronger.

If we laſtly examine the difference between the old method, and this, in the condition of the land after the crop, there is no compariſon, for in the one it is exhauſted, and in the other in full ſtrength. A field that, after the expence of dunging, has borne a crop of wheat, is not fit to bear another, but the crop muſt be changed; and when it has borne two more of an inferior nature, all the work muſt begin again. But by horſehoeing, when it has borne one crop of wheat, it is fit for another; and the two furrows upon which the next crop is to ſtand, may be plowed as ſoon as the corn is off. The farmer who follows this method, can plow dry and drill wet, without inconvenience: he can ſow early, becauſe he can, in ſpring, help the ſtaleneſs of the ground by hoeing.

The ſucceſs of horſehoeing is ſo evident in the giving nouriſhment to crops, that ſome have objected to it, as making growth too rank. There could not be a fairer confeſſion of the excellence of the practice: for that which is capable of giving too much nouriſhment, may be ſo managed as to give juſt enough. When corn is too rank it is liable to accidents; but it is in the power of the farmer to give it ſtrength enough, without giving too much.

They ſay if this can enrich poor land, to make it bear great crops of wheat, it will make rich land too rank. The leſs of it may be uſed: and we have provided againſt ſuch objections already, by adviſing the intervals to be ſmaller in rich, than in poor ground.

As ſome have been too violent againſt it, others have been extravagant in its praiſe. Enough may be ſaid, without enlarging beyond truth.

We have propoſed the true ſtate of the caſe between the old and the new method, and we have written with impartiality. We have ſtated the advantages to ſpirit up farmers to make a tryal; this advantage with which it has been uſed in France makes us earneſtly deſire here.

If we were aſked whether moſt advantage may be had from the common methods, or from horſehoeing without manure, we ſhould anſwer from the horſehoeing method; but the greateſt benefit will be obtained by employing both together.

The improvement of eſtates appears ſo plain an advantage to the nation, as well as a private benefit, that it would be ſuperfluous to enlarge on it.

Whoever encreaſes the yearly value of his eſtate, encreaſes his own, and the yearly riches of his country. A great author ſays, "He that makes two chives of graſs grow "where but one did before, does his country more real "good than all the generation of politicians together."

To the profit we cannot but add, two other important articles, viz. health and pleaſure; both which are the natural conſequence of ſuch undertakings.

Some exerciſe is neceſſary to preſerve health; and ſome relaxation and amuſement, are equally beneficial to preſerve and improve the faculties of the mind.

All theſe good ends may be eaſily obtained, by viewing thoſe improvements, which, if diſcreetly managed, would be far from expenſive; be a bleſſing to the neighbourhood, procuring laſting wealth to a man's own family, and perpetual encreaſe of riches to our country.

This ſeems more particularly to require the regard of thoſe gentlemen, who, being debar'd by our laws from encreaſing their eſtates in land, may be induced to improve the value of thoſe they are well intituled to; eſpecially as one pound gained this way, is generally worth near two of old rents, as it is ſcarce over loaded with additional taxes or aſſeſſment.

And how pleaſing a proſpect muſt it be, to ſee an eſtate well laid out, and in good order, well fenced, and tenanted, and the yearly value thereof greatly encreaſed, as well as the good of the tenants promoted, with much leſs expence than a pack of dogs, a ſhowy houſe, or a pompous piece of water, would occaſion.

I ſhall only mention one delight more, the moſt natural of all others, a perpetual companion of the huſbandman; and that is, the ſatisfaction of looking about him, and ſeeing the effects of his art and diligence; to be always gathering of ſome fruits of it, and at the ſame time to behold others ripening, and others budding; to ſee his fields and gardens covered with the beauteous creatures of his own induſtry; and to ſee, like God, that all his works are good.

I cannot be ſo ſanguine as to think, that if perſons of tolerable circumſtances ſerved apprenticeſhips to this art, "We ſhould ſee, as is ſaid, many aldermens eſtates made in the country," yet I verily believe, that if our gentry would turn their thoughts to ſubjects of this nature, inſtead of other purſuits, it would ſave many a fine eſtate, and preſerve many an ancient family from ruin; and as to the plain gain of it, I have known ſome inſtances where perſons in very private ſtations have gained ſeveral hundreds a year, by taking long leaſes of uncultivated lands, fencing and liming them well, and then letting them out again; whilſt others have paid the purchaſe money of good eſtates, by the improved produce of the lands; and I have known an eſtate ſold at five and twenty years purchaſe, parcell'd out in farms at five and thirty, and ſome of theſe ſold again at five and fifty, and they then brought in near five pounds per cent. and the tenants did as well as at firſt. Such an improvement was made by only taking field land into cloſes by good walls, and then improving them by lime, or by lime and dung in proper compoſitions.

As to the uſefulneſs of this to the mind, as well as to health, I may venture to affirm, that I ſhall herein meet with the concurring opinions of phyſicians, as well as the general practice of the moſt conſiderable perſons of all ſtations, who take all opportunities of getting into the country when their affairs will permit.

Whoever conſiders that our ſouls and bodies are cloſely united, and wonderfully effect each other, will evidently find the neceſſity from our nature, to have ſome relaxation, to preſerve that health, and thoſe faculties.

The innocency of this life, is the next thing for which I commend it; and if huſbandmen preſerve not that they are much to blame, for no men are ſo free from temptations.

I would not here be thought to engage gentlemen in huſbandry, as a conſtant occupation, or to expect they ſhould hold the plow, or fill the cart.

But can they, whoſe health or affairs require their reſidence in the country, employ their ſpare hours in more uſeful, more innocent, or more delightful employments.

The mind of man muſt be employed, or will grow out of order, and theſe methods may be of much greater ſervice to the young and unexperienced, than ſome in years are willing to allow. Probably they may ſerve to open their minds, and give them ſuch a train of thinking, which may lay a foundation for a method of application to buſineſs, what will end in a ſolid judgment; and if purſued with diſcretion directly, or in its conſequences, may diſpel the tedioufneſs of many a melancholy hour, remove the anguiſh of many a ſorrowing heart, procure the eaſe of many family; and lay the foundation of eſtabliſhing a ſteadineſs of virtue in many an innocent unguarded heart.

If health, pleaſure and profit, are the conſequence of theſe undertakings, it may not be improper to enquire, how they come to be ſo little purſued; what lion there is in the way to obſtruſt or terrify us.

Three things may probably be objected.

That this is beneath the dignity of a gentleman.

That ſeveral who have buſied themſelves in buildings, alterations, and pretended improvements, have felt bad effects from ſuch undertakings. And

That gentlemen are unacquainted with theſe things; and conſequently liable to be frequently impos'd on in the management, and deceiv'd in the expected ſucceſs of ſuch projects.

To the firſt it may be anſwered, that we do not propoſe gentlemen ſhould condeſcend to the meaner labours of the huſbandman; but ſure a prudent ordering of his own affairs, can never be below the dignity of a wiſe man; and if examples of the greateſt in moſt ages, might prevail againſt the weak modes and practice of the moderns; that method of life can never be contemned, on which Tully, Virgil, and Horace, have beſtowed ſuch encomiums; from which dictators have been called to the command of armies, and to the pleaſures of which mighty emperors have retired from the fatigues of grandeur.

In this corner that great man (Scipio) ſays Seneca "the "terror of Carthage, and to whom Rome owes that it was "but once taken, after manuring his fields with his own "hands, would waſh himſelf," for he choſe to work, and tilled his ground himſelf, according to the cuſtom of our fathers.

As to the ill conſequences of applications of this kind; I believe if thoſe inſtances were particularly enquired into, the ill would be found to ariſe from ill-deſigned, ill-executed, or extravagant houſes, out-houſes, dog kennels, or monſtrous gardens.

As to the laſt objection, that gentlemen are unacquainted with affairs of this nature, and liable to be impoſed on; the truth is not be denied, but the principal intent of this undertaking, is to provide a remedy for this inconvenience, by laying down rules to guard the unwary, and to guide the unexperienced.

Improvements of eſtates may be conſider'd in three views, as they ariſe from what I ſhall call natural advantages; convenient buildings, laying lands commodiouſly together, dividing them into proper parts, fencing them well, with things of the like nature.

Secondly, by what may be called artificial improvements from manures, as by lime, ſalt, or burnbaiting; and by the different ſorts of foreign graſſes, as clover, ſaintfoin, and the like.

Laſtly, as they ariſe from the common or late improved methods of huſbandry, as dunging, plowing, and well managing all ſorts of ground.

We ſhall at preſent conſider the firſt. Things of immediate uſe being of a greater conſequence than the moſt curious ſpeculations.

This rule is applicable to every farmer and labourer, and indeed to men in every ſtation of life.

As examples make deeper impreſſion than precepts, I ſhall mention a caſe of my own, in a particular of this nature.

When I purchaſed the eſtate where I have ſince lived; I found a well, with its uſual conveniences, about ſixty yards from the kitchen door, and when I had fixed a pump there, I ſtill found the expence of carrying water, taking in brewing, waſhing, and other accidentals, half a crown a week: on this I laid the water into the houſe from a ciſtern, placed under the pump; by which means the houſe was eaſily ſupplied.

The expence was about eight pounds, and for this one pipe was laid into the kitchen, one to the waſh-ſtove in the brewhouſe, one to the ſide of the copper, and another into the garden.

Every farmer will find the difference of milking near home, and at a diſtance; and in one place only, or in different paſtures.

A good oeconomiſt will contrive his affairs, as far as he can, with prudence, ſo that what is moſt wanted ſhall be the neareſt, and thoſe at the greateſt diſtance which he, or his family, have leſs occaſion to reſort to.

The ſubſtance of natural improvements, may be compriſed under the following heads:

Commodious buildings;

Laying farms and lands conveniently together;

Dividing large grounds into leſſer:

Keeping up good fences and places for ſhelter;

Supplying grounds with water to float them, and makeing proper watering places;

Draining grounds which are too wet;

Proportioning corn land and graſs ground properly for the farm;

Making good roads;

Laſtly, I ſhall mention the alteration time makes in the value of moſt lands.

1. Of commodious buildings;

Here I ſhall only obſerve, large timber is one of the greateſt expences of building, and great roofs require the greateſt expence to ſupport them: in farming affairs a narrow and long building will anſwer the end as well, or better than a ſhort and wide one; except that where they throw their corn to clean it, which requires ſpace, the expediency of which method will be hereafter conſidered.

In other caſes, having room to thraſh in the barn, and a door towards the ſouth weſt, the farmer will ſeldom want a wind to clean his corn; and when ſuch a caſe happens, a hand fan will ſupply the want of it.

As to ſtanding for beaſts, thirteen feet wide will do for four, whereas ſix requires twenty foot wide, and every perſon of experience well knows, that building a roof of above twenty foot wide, and the expence of keeping it in order, will far exceed that of thirteen feet wide with the addition of ſeven or eight feet more in length for a third row of beaſts.

As to the great barns formerly erected, they are little valued now; ſeveral judicious farmers refuſing to uſe them: apprehending their corn and hay to be better and ſweeter, when ſet in ſtacks in the open air, than when houſed. And in many places the tying up their beaſts, at any time of the year for the whole night, is omitted.

What is of greater concern, is the benefit which ariſes to the owner of a farm, as to the eaſe in the management of it, and the preſerving it in a proper ſtate of huſbandry, when the buildings are prudently placed, in compariſon of thoſe erected at a diſtance, or in low places from which the manure can ſcarce be returned to the land again, except at a great expence; and conſequently the diſtant land muſt be gradually impoveriſhed.

When the buildings are on the level with the land, and in the midſt of it, the manure cannot be loſt, and the whole courſe of huſbandry will be carried on with more eaſe, and at leſs expence.

The advantage of this I ſaw very plain, in removing an old houſe which ſtood in a village diſtant from the land, into a proper place in the midſt of the farm; by which means they always milked at the door; and one man, woman, horſe, and ſledge, managed the ſame in general with as much eaſe, as two men, two women, a cart and horſes did before. Any one may compute how much was ſaved by this in the year.

Lee walls (as they are call'd) are frequently erected in the ſhape of a great L, on commons, and in large paſtures, by common tenants, to ſhelter cattle againſt ſtorms, from every point of the compaſs. The benefit of them is well known; and I have wondered ſomething of this kind is not more frequently to be met with near London, and ſeveral of the marſhes in Kent and Eſſex.

A ſmall uſeful building for this end, might be contrived at little expence; and conſtructed ſo as to be taken in pieces, and carried from one place to another.

In a bleak marſh in Eſſex this ſummer, with two men in one day I made a ſhelter on a riſing ground for the workmen, and ſo on, by ſinking the ground above a foot, and making the ſide walls and back part with turf and ſoil, and then covering it with boards, which anſwered every end, and will do ſo till the work is compleat, and the wood carried away.

When the late Czar built Peterſburgh, he contrived the houſes ſo, that any one might on occaſion be taken down in two hours, and ſet up again in another place.

A roof alone might be order'd ſo as frequently to be uſeful to ſet over a quantity of new hay in ſummer, till a large rick be made, or even to cover the rick till it was finiſhed in the nature of a moveable Dutch barn; by which method a great deal of damage and trouble, by intervening rains, might be avoided. Few farmers but ſuffer yearly by rains, before their hay ricks and corn ſtacks are well covered.

Some uſe old tarpawlins: theſe may be of ſervice, and ſo would two or three fleaks thatched, and hung croſs a rick, which any farmer may eaſily procure, or make for himſelf.

Slight moveable buildings might be of equal uſe to our horſes and cattle in ſummer, by affording them ſhelter againſt violent heats, as they do in winter againſt ſtorms, froſts, and cold.

Our bodies, and thoſe of our beaſts, are much alike: we are ſubject to the ſame diſeaſes, and alike ſenſible of heat and cold, piercing winds, and violent ſtorms.

In Jamaica there are times, when, unleſs the labourers put on their cloaths, they will be in danger of loſing their lives; and in moſt places with us, piercing blaſts have been almoſt as prejudicial, and ſome winds ſubject us to particular diſtempers.

Every houſewife is ſenſible of the ill effects ariſing from cows being hurried about in hot weather, both as to the goodneſs and quantity of their milk. And I know a farm in Cheſhire, which on a moderate computation, is thought to be damaged five pounds a year by the cows being deprived from ſtanding in a river in the heat of the day; and the prejudice to the paſtures, by their gadding and running about, is very well known.

The next head we have to conſider is,

The laying farms and lands conveniently.

Two acres together, of the ſame conditioned land, is of as much value as five half acres in diſtant places in the ſame open fields; the advantage is proportionably greater when the portions of land are leſs; and it is not uncommon to find many parcels of land both in open fields, and good meadows, containing much leſs; which when laid together, and incloſed, are often more than double or treble the value they were before, eſpecially near great towns, or in countries where graſs ground is ſcarce. Within my memory, there have been fifteen hundred acres of field land incloſed near Derby, which from eight or nine ſhillings an acre, whilſt in the open field, is now let from three pounds to twenty ſhillings, and on an average at about thirty.

This leads to the dividing one part of large grounds from another in proper quantities.

This depends on the ſame reaſoning as the laſt articles; and to the inſtances before given of the benefit of it, I ſhall here add another of a formerly remarkable piece of land, called Haddon paſture, near Haddon in Derbyſhire, the ancient ſeat, and place of reſidence, of the Duke of Rutland's anceſtors. This was a large piece of lime-ſtone ground, and was uſually joiſted by taking in beaſts from all the country over.

It has been lately divided into ſeveral parts, with lime-ſtone walls, and let out again to under tenants for two hundred pounds per annum more than the original rent.

I could give other inſtances wherein I have been concerned, of the ſame proportionable profit ariſing ſolely by the parting large grounds with lime-ſtone walls in counties where that material is to be had; which, though not ſo ſightly, may perhaps be found the moſt beneficial fences in the kingdom.

Where lime-ſtone is to be had near, the ſtone will be got, led, and walled ſeven quarters high, for about four pence per yard forward. The foundation is but two foot broad, there are no ditches on either ſide, or any loſs of ground; for the ſcythe may cut, or the plow; and the cattle have ſhelter and food, cloſe to its ſide.

Here are no roots to run and rob the corn, no branches to drop on it, theſe walls nouriſh the land ſeven or eight yards near them. Many are warm againſt any plowing nearer hedges than ſeven or eight yards; and a very juditious farmer told me, that he never expects or finds above half a crop near hedges, in proportion to what he reaps in the middle of the field.

This ought to be minded, in thoſe places where the culture of corn is deſigned; near St. Alban's, and toward Hempſtead, the corn fields are generally large, twenty acres or more each.

Where new hedges are to be raiſed, white thorn is generally beſt; and if planted in proper ground, may be made to ſave itſelf in four or five years, and a dead hedge, once repaired, will guard it till it is ſafe.

I once planted a hedge of this kind with ſtrong ſets out of the woods, of above an inch diameter, ſet them eight inches aſunder, and cut them within eight or nine inches of the ground; ſome of them ſhot that year ſix foot high, and all ſoon made an hedge for cloths, when cut and kept in order, four foot deep, and a yard over.

I had much the ſame ſucceſs with ſome thorn buſhes I removed, cutting the heads, they ſoon anſwer'd. I have let ſome white thorns grow as large as trees; and there are ſome ſingle ones on the Derbyſhire moors near Middleton, by Youlgreave, which are as large as middling aſh.

This method of raiſing white thorn is not practiſed. But I cannot but think from the nature of the ſhrub, that a deſign of a gentleman of my acquaintance, was both reaſonable and feaſible.

He ſet in two acres of ground ſeveral rows of white thorns, which one out fence ſecured. Theſe, when grown up, ſupplied him with a ſucceſſive ſtock of ſets; and when he had occaſion to take in any new piece, he took part of this to about a yard high, and ſet them as a new fence, the thorns fenced the outſide, and the ground being corn, and nothing admitted into it after the corn, at the end of the ſecond year it made a very good hedge.

Such a tryal can be no great hazard; the young ſets may be bought at four pence per hundred, which, at nine inches diſtance, will go a great way; and if they are to be rais'd from the berry, there is a method taken from an experiment of Sir Iſaac Newton's publiſhed by Mr. Bradley, of bringing them to ſprout in the firſt ſpring, by placing them in wheat bran, kept warm, and ſometimes wetted a little.

This I tried, and they ſprouted in ſpring, but if too much wet be given them, it will be in danger of rotting them.

I have a diſlike to black thorns, on account of their ſpreading in the ground; white thorns are ſo hardy, as to thrive where few trees will, ſo it may be uſed as a good high hedge, or as a row of trees, to ſhelter againſt cold bleak winds. I have ſeen ſuch a hedge grow amongſt elms, which, cut properly, ſeemed to be one entire cloſe fence, of forty foot high.

As to dividing of graſs ground, many are of opinion, that one cloſe of ten acres will maintain as many cattle as four of three acres each; the reaſons they give are, that in leſſer grounds cattle quickly walk over them, and being ſtained with their feet, they will not care to feed thereon; whereas, in larger fields they have room to range and feed, till the ſtained places be refreſhed with rain or with the dews; that there is a loſs of ground by hedges and ditches, that 'tis eaſier to get water in a great piece than a little one, and that cattle love a large walk, and like not graſs under the dropping of trees.

To all this it may be anſwered, that the dividing ten acres into four parts, allowing two yards for the hedge and ditch, theſe take up but about one ſixth part of an acre; that if there be water it may be eaſily laid to two or three of the leſſer cloſes, or that may be eaten firſt which has the water, and then laid to, that the other hedges and trees may be kept down, ſo as not to ſour the graſs much; or if permitted to grow they will be of above an equivalent for that damage. And when the cloſes are eaten by turns, the firſt will be wonderfully recovered and ſweetened, before the cattle are brought back to it; and it is not to be imagined what conveniences ariſe from four or five ſuch ſmall cloſes. At the beſt managed farm I know, they have ſix of them, they can go into or from the fold yard, in which they can keep their ſwine and clover, and let them out each night to their ſupper; keep a cow or two on good graſs, for milk and butter, a horſe or two, to be ready on every occaſion, and eat the others as proper, whether they be turnips, clover, or graſs; or lead through them to farther diſtant larger cloſes, or keep a piece of choice graſs, clover, or turnips, to top up fat beaſts with, or ſupport them with when other paſtures fail.

Fences are a ſecurity to our property, and the great preſervers of piece and quiet in a neighbourhood. They preſerve our grounds and our cattle warm and well, and have ſuch viſible good ariſing from them, that it becomes a ſort of a proverbial ſaying, amongſt the farmers, that "A warm, "cloſe, high hedge, is half the cattle's meat in winter, cau-"ſing that which is given them to do them the more good.

Our next article is, the ſupplying grounds with water to float them, where that can be conveniently done, and making proper watering places where wanted and ſuitable.

Where lands are ſituated near rivers, the benefit of floating meadows in dry ſeaſons is eaſily obtained; for water may be eaſily guided from place to place, and near ſeveral great towns there are meadows which muſt be mowed and cleared by Midſummer, lying common after, which owe their returning fertility to the waſh of the floods overflowing them after the hay is got in; for which purpoſe thoſe banks which are raiſed to ſecure the graſs from floods, are immediate after opened in ſeveral places, to enrich the ſame meadows by all the ſucceeding waters, till the following ſpring, when the banks are again made up.

This is ſo fine a way of improving, that wherever water comes from off rich lands, or is impregnated with the waſh of any town, ſuch a floating is much to be deſired; and it is a very good practice to mix manure with common water, ſtirring it as it paſſes, as the water will, this way, convey it in the moſt beneficial manner to the graſs roots. Where none of theſe are to be had in great droughts, the conveying common water over the meadows, will be very beneficial.

What is more immediately under our preſent conſideration is, how to provide for that want of water, which is commonly the caſe in lime-ſtone, chalk, ſandy, and gravelly grounds, which though they receive their equal ſhare of rain and dew being porous, the wet ſoon ſinks in, and is loſt.

In ſome grounds of this nature there are pools of water, which ſupply the cattle. Where ſuch are not met with, there are very few quantities of land where, in a low place, the rains may not be brought from the higher ground, and a watering place made, by laying in a proper mixture of clay, or by a bed of lime rubbiſh well beat together. Worked chalk will anſwer the ſame end, laid at the bottom, and ſides of a pit, which if well made, will laſt long and anſwer the purpoſe, eſpecially at the end of ſummer, and in winter. Care muſt be taken to cover the bottom with ſome ſort of pavement, to prevent the cattle from poaching holes with their feet; and there muſt be ſome walls to keep the tempered mortar ſafe on the ſides, as high as it is propoſed the pool ſhould ſtand; and little cuts, if neceſſary, to bring the water from above, to the place prepared for it.

The firſt of this kind I ſaw, was in a gentleman's lime-ſtone park in Somerſetſhire. The owner told me it coſt him at firſt thirty pounds, and ſoon failed; but the breach being found and prepared, it had then ſtood firm many years, and was a very large one. Small ones are now made, where the materials are near, for forty or fifty ſhillings, and may be ſo contrived as to fit two or three diſtinct parcels of land, by parting them in the middle, or by looſe moveable rails, to lay them to one ſide or the other.

The ſame gentleman had walled his park high enough to keep in his deer with lime-ſtone. He poured in two beds of mortar whilſt it was building, one at about two foot high, the other about four, and the wall ſtood firm.

Exceſs of wet is as prejudicial as the want of it. This brings me to the manner of taking water off, or draining grounds which are too wet.

The firſt point is to find the loweſt place by which the water can be carried off, and there open a wide trench, of depth ſufficient to drain the whole, which may properly be kept open; into this ſide or croſs drains may be laid and covered.

The beſt method for theſe croſs drains is that uſed in Eſſex, by making a trench near two foot deep, not above two or three inches wide at bottom, then filling it with thorns, or any rubbiſh wood, and covering it by turning the turf downward. The difficulty is to lay the drains in the loweſt places, in which the Eſſex men are particularly ſkilled.

I have known, where ſtones were in plenty, little ſuffs made at bottom, and ſmall ſtones poured on it a foot deep, ſo covered up, which anſwered very well. I have alſo known wet grounds much mended by very ſmall gutters, of four or five inches wide, leading to proper deſcents, and what came from them ſpread on the ground, to prevent its being trod in again. Theſe are eaſily made, and eaſily kept open, and if deeper than the roots of the graſs, they will on clayey ground carry off the wet very well.

The proportioning of corn land and graſs ground proper for the farm, is an article ſcarce poſſible to bring under any general rules. Since the new huſbandry has prevailed, the farmer may keep more in tillage, or graſs grounds of natural or artificial graſſes, as he pleaſes; and needs not want of either to employ ſuch a team as he thinks proper to keep, ſuch cows as he chuſes to milk, ſuch cattle as he propoſes to rear or feed; in moſt of which a judicious farmer, if he has ground enough, may make it anſwer any end he propoſes, with proper application.

One general rule indeed he ought to adhere to; which is never to have more ground in tillage, or appropriated for hay, than he can huſband and dreſs well.

He had better have two good acres of corn than ſix of bad, or four of middling: the expence attending the worſt, is as great as that of the beſt.

The ſame in proportion may be ſaid of hay ground; and in both caſes, if the worſe ſort be paſtured, or lie fallow, it will be of ſome benefit.

Of making good roads.

The making roads good meets with ſo general approbation, that there ſeems not to need any thing be ſaid to influence gentlemen, to do it about their own houſes, and alſo to promote it in their reſpective neighbourhoods.

This might be generally compaſſed by the uſual labour of the villagers, and a little money expended under the direction of a perſon ſkilled in the work; by which method I have known hills, before hardly paſſable by a ſingle horſe, made as eaſy for a coach as a ſtreet; and the ſide of a precipice made a ſafe common road, without danger or terror to the traveller, by a wall erected next the precipice.

The ſafety to man, horſes, and carriages, the cheap conveying all ſorts of portables from place to place on good roads, and the time ſaved by it, will ſoon be an equivalent for the expence, and perhaps extend its uſefulneſs to unexpected diſtances; ſo that it may be a bleſſing to a country, and to future generations.

The greateſt improvement of this kind I ever knew, was betwixt Wych and Worceſter. When I firſt travelled that road they were beginning to mend it, I ſaw eight or nine horſes hard ſet to draw a tun of ſalt; but paſſing there again ſome years after, I ſaw no waggon had above four horſes, and ſome but three, to draw the ſame quantity.

The Romans in this particular demand our applauſe and imitation; for they cauſed good roads to be made from place to place, wherever their legions came, and ſome of theſe works are ſtill viſible and uſeful amongſt us.

The people of Cheſhire and Lancaſhire have, I believe, laid out more money in making good roads, and to better purpoſe, though materials are very dear in many places there, than thoſe of any ſix counties in England, excluſive of turnpikes. Moſt farmers there have a horſe pavement from their doors to the great roads; and ſome gentlemen have expended an hundred pounds, in paving from the road to their own doors, which in ſome places would, if wiſely managed, repair the roads for ſome miles.

A good paviour will carry on a horſe cauſey in a day, ſixty yards. I had a ſervant of my own, who with a labourer to aſſiſt him, and teams to lead to him, in a lime-ſtone country, made a new road above eight foot wide, and ninety long, in one day, ſetting both outſides with the largeſt ſtones for near two feet on each ſide, where the wheels run, and filling and raiſing up all the middle with what we call lime-ſtone gravel (being ſmall lime-ſtone) which if not trod on, in a few days, will bind like a rock, and on which the horſes will tread freely, which they never do where the roads are ſet with great ſtones.

The late ingenious Mr. Cooper, of Leiceſter, who gained ſo much reputation by mending their roads, brought all his work to the following certainties.

Twenty up-heap'd ſtrikes (or buſhels) were a load, which, when firſt meaſured and levelled as uſual, laths were nailed on the carts for aſcertaining it for the future.

Each farmer filled his own cart, and had generally one penny half farthing each hundred yards it was carried.

The gravel was got and ſpread at one penny per load, and a perſon was appointed to ſee all fairly done.

Water gravel never makes ſo fine a road as what is dug out of the earth, but where that is eaſier to be had, being mixed with a ſandy ſoil to bind it, it will make a good road.

In ſome places we meet with a ſoft gravel, having too large a mixture of clay, marle or ſand amongſt it, which, though laid thicker on the road than ordinary, will not ſtand one year's wear. Yet we have found that ſome gravel, after ſcreening it, as it is done for gardens, and leaving what falls through behind, to make as good and durable roads as any we have.

Theſe particulars I have taken from a manuſcript of that gentleman's never publiſhed.

The laſt article I have to mention here is;

The alteration time makes in the value of moſt lands.

This difference cannot be ſaid to be an improvement, but an alteration, ariſing chiefly from the additional quantity of gold and ſilver conſtantly brought into theſe parts of the world; ſo that, properly ſpeaking, gold and ſilver are of leſs value than they were formerly, as an ounce of either will not purchaſe half of the quantity of the neceſſary proviſions for life (excluſive of the taxes laid on ſeveral of them) which they formerly did.

The rents reſerved in money, in college and other leaſes, and thoſe paid in corn, which in Queen Elizabeth's time were of equal value, now are ſo different, that they are a full proof of the variation; for the half now paid in corn, malt, and ſo on, is at preſent above three times as much in value, as the other moiety ſtill paid in money.

Lands then let at twenty ſhillings per annum, ſhould now be of the value of near three pounds, unleſs in ſome extraordinary circumſtance; as where the great improvements made by lime, and artificial graſſes on high lands have ſunk the yearly value of thoſe low meadow grounds, which, being enriched by the over-flowing of the rivers from the lime-ſtone mountains, paſtured with ſheep, uſed to be the only places where ſpring graſs, and early fat meat were to be had: it being alſo within memory, how better families were obliged to lay in great quantities of hung beef for winter, very little of that ſort of meat being then killed in that ſeaſon, even in great towns.

The reader has been led through all the various ſoils to be met with in theſe kingdoms, and the different methods commonly taken to improve them by dung, as well as by lime, ſalt, and the like: all theſe have been copiouſly treated of, and the method and manner of plowing, ſowing, harrowing, and rolling, have been explained. The ſeveral corns, graſſes, and roots themſelves come now to be particularly conſidered.

But before we enter into the diſtinct conſideration of theſe, it will be proper to take a ſhort view of the antient and modern tillage; theſe being ſtated in a plain manner, the reader will be inſtructed to form a proper judgment of their advantages and diſadvantages, and well know how to fix to himſelf a ſure rule for his conduct.

Of the old huſbandry.

The uſual method of tillage in the corn counties in England, was conducted in the following manner.

Each village in the corn counties had three diſtinct common fields, uſually of equal quantities; which were appropriated to three ſeveral yearly courſes of tillage.

One of theſe three, each year, was appropriated chiefly to wheat, though ſometimes it had barley in it, and this has alway born the name of the wheat field.

The ſecond is called the peaſe field, being ſowed, for the moſt part, with that pulſe, though beans and oats, as found convenient, are commonly ſowed therein alſo.

The third field, or ſide, is called the fallow field, as not being ſowed at all; but repeatedly plowed, harrowed, and manured, as the owner judges beſt for his land, to prepare it for the following crop.

Theſe three names are ſucceſſively applied to the ſaid fields, according to their courſe, of being ſowed with wheat or peaſe, or lying fallow.

Theſe were the rounds of the Engliſh tillage; and they were ſufficient to produce good corn, and that in great quantities: and the ſame method is ſtill continu'd in thoſe parts of the kingdom, where the new huſbandry has not prevailed.

The manuring, and two year's due plowing, the two fallow years (with proper plowing and ſowing the other four years) were found ſufficient to produce four ſucceſſive reaſonable good crops in the ſix years; and thoſe four crops produced a ſufficient quantity of manure, for the dunging the ground during the ſaid circle of ſix years.

But when lime was found beneficial for producing of good corn, and was applied accordingly for that purpoſe, where that could conveniently be had; it made the well manuring the common corn fields much better and eaſier, and rendering the leſs dung neceſſary for the ſaid four crops in the ſix years.

And though corn was alſo formerly ſometimes ſowed in incloſed grounds, and much more ſo ſince the late improvements made by clover and turnips; yet the open fields always had, and ſtill have the preference, as producing the beſt and ſweeteſt corn, and as the leaſt ſubject to ſmuts and blights; and it is alſo found, that corn growing near an hedge has not uſually ſo great a quantity as that which grows in the middle: the reaſon for which will be mentioned hereafter. Open fields have alſo more ſun and air, are leſs annoyed by birds, and have leſs fences to be taken care of, thoſe being uſually made by the lands adjoining to them.

There are ſome inconveniences open fields were always ſubject to, by their being generally divided into ſmall parts, the property of different perſons; for by this the farmer is obliged to plow always the ſame way, obſerving alſo pretty much the ſame times and ſeaſons of plowing, ſowing, reaping, and fencing.

The dividing the common corn fields into ſo many ſmall parcels, is worthy a diſtinct conſideration. A farm of mine, under thirty pounds per annum, contains one hundred and fifty three pieces, forty of which are not each a rood, and two acres no where lying together, and the whole townſhip is much in the ſame manner, very few of the larger eſtates having two acres together.

This method of dividing fields, is generally thought owing to a political deſign of our anceſtors, to promote the culture of corn, by preventing the fields being incloſed, as they were made the diſtinct property of ſo many different perſons.

But I preſume it was rather owing to the parting it amongſt the followers and ſoldiers of thoſe who conquer'd, as a recompence for their ſervices.

This ſeems the old method of the Saxons, as appears by the cuſtomary mineral laws in Derbyſhire. By theſe, though the whole mineral field is at liberty for any perſon to work in, yet if any one finds a mine there, he can take but ſo many yards as the firſt proprietor; and every other ſubject, and he himſelf may take other quantities of two and twenty yards, one after another, till the whole be poſſeſſed or taken; but then, every diſtinct ſaid number of yards ſo taken, is a diſtinct title and poſſeſſion, and may be ſeparately owned by different perſons in partnerſhip. This and many other cuſtoms, prove that the law uſed there is the beſt remain we now have of the Saxon method of proceeding, which was ſhort and clear.

The method now mentioned was, in general, the courſe of the Engliſh tillage, till the introduction of the foreign graſſes, gradually within about eighty years laſt paſt; and the advantages by the ſowing theſe and turnips, in incloſures, and now in many of the open fields, and particularly by that of clover.

By clover and turnips many of thoſe lands which formerly were of little value, have been rendered profitable, and brought to produce good corn: and thoſe lands in the open fields, and in the incloſures, which formerly were thought to anſwer well to the plow in the courſe of tillage, have been improv'd even in that reſpect, by the ſowing of clover and turnips: and that third year, which was before loſt by lying fallow, is now generally made to produce a crop of clover or turnips worth, if well managed, at leaſt twenty or thirty ſhillings an acre, often much more. Theſe growths are ſo far from occaſioning any additional expence, that they are found much the cheapeſt and beſt methods of preparing the land for corn.

Theſe things have given a different turn to the general courſe of our huſbandry; and where the ſowing of clover and other graſſes, and of turnips and other roots have prevailed, the method has obtained the name of the new huſbandry: to theſe we may not improperly add the drill huſbandry, which is not ſo modern as ſome pretend, being introduced here by the late Earl of Sandwich, as appears in the Philoſophical Tranſactions *. The inventor of it was Don Joſeph de Lucatello, who had it publickly tried in Germany and Spain, and had a patent granted him by the King of Spain, about the year one thouſand ſix hundred and ſixty five, as the inventor of the drill plow, called then the Sembrador, contrived to plow, ſow, and harrow at once.

The ſame method of huſbandry being practiſed by the late Mr. Tull, who wrote a book on this ſubject, has now prevailed in ſeveral places, and may be properly conſidered under this head, as a principal part of the new huſbandry; to which we ſhall now proceed.

Of the new huſbandry.

The advantages of this new method of huſbandry, when ſet in a proper light, and compared with the former cuſtomary tillage, are ſo great, as juſtly to entitle it to the preference: and it very well deſerves the attentive conſideration of every perſon any way intereſted in affairs of this nature.

As we have ſtated the courſe of the former method of huſbandry, we ſhall endeavour to do the ſame by this: but the modern method admitting many more variations, both as to the different ſorts, and greater number of ſeeds to be ſowed, and alſo more yearly changes of the corn, than the other, the courſe of this new huſbandry cannot be compriſed in ſo few rules as the other.

In this there cannot be many certain rules of ſucceſſively ſowing of grain; for there being many more ſeeds, and roots to have their turns, they give the farmer a much greater latitude of varying and altering his crops.

By this method it is propoſed, that the farmer ſhall have ſix ſucceſſive profitable crops, for ſix years together, from the ſame parcel of ground, without the loſs of any one year, by letting it lie fallow: at leaſt he may reaſonably expect eleven good crops in twelve years; and all theſe eleven or twelve crops ſucceſſively, year after year, to be of as valuable ſorts of grain, and as good in their kinds, and got with as little trouble, and at as little an expence as the four crops obtained in ſix years, or as the eight in twelve years uſually are in the open fields.

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* Philoſ. Tranſ. 2d Vol. 741--744.

To manifeſt the truth of this, it will be neceſſary to ſtate the courſe of this new huſbandry in two or three different methods.

By one method wheat may be ordered to have its turn once in four years. Thus,

Firſt, wheat. Second, beans, peaſe, or oats. Third, clover. Then wheat again.

Or beans, peaſe, or oats, may be varied, and the clover omitted, as the farmer pleaſes.

By another method, the wheat, barley, or other grain, will ſucceed one another but once in ſix or ſeven years; and may be ordered after the following manner.

Wheat the firſt year. The ſecond, beans, peaſe, or oats. Third, any other of the laſt three. Fourth, turnips. Fifth, barley. Sixth clover, and then a return to wheat, or any other of the crops; for which the ground will be well prepared again: or if it be liked better, the clover may be continued two years, and will anſwer very well.

Reckoning the clover as proper to be ſowed two years in the ſix, here is a proviſion for eight years crops, out of which the farmer may chuſe any ſix of them he thinks the moſt ſuitable to his ſoil and circumſtances.

By this method he reaps three of the richeſt crops, and one of beans or peaſe, one of turnips, and one or two of clover, in ſix years ſucceeding each other; whereas there can be but four obtained in the ſame time, by the common tillage. Conſequently the new method has the advantage of two more crops in ſix years, than the old: which on preſumption that the crops are equally good, is greatly to the advantage of modern huſbandry.

Theſe grains and ſeeds may be farther varied, the better to prevent the too quick a return of ſowing the ſame corn again on the ſame ground, which is generally attended with a poor crop not only in all grain ſowed in the field, but in every herb and root propagated in the garden. Therefore the judicious farmer will frequently change the grain, herbs and roots, from one ſpot of ground to another; till time, or ſome courſe of huſbandry, hath prepared the firſt ground again for producing another good crop of the ſame. Nothing but horſehoeing can ſet aſide this neceſſity.

A very little conſideration will guide the farmer in varying the above named grains, graſſes, and roots, ſo as to be reaſonably aſſured of obtaining good ſucceſſive crops.

To the great variety of ſucceeding crops, which may be contrived from the ſeveral ſpecies of grain and graſſes above mentioned, the farmer may add many other new changes, by the ſowing of rye, French wheat, lentils, coleſeed, and ſo on; with which he may make ſuch various changes, as to carry on a courſe of profitable tillage of the ſame ground, to a much greater length of time, eſpecially after it has had the benefit of being marled, limed, or chalked. Four bells will change or vary their places ſo as never to come again in the ſame order, four and twenty times, and five one hundred and twenty times: here are many more than five ſorts of grains, graſſes, and roots, which may be brought into the ſucceſſion.

Wiſe farmers will not carry it to thoſe great lengths: but will chuſe to lay down a part of the ground they have in tillage, with profitable laſting artificial graſſes or good natural ones; and break up ſome freſh ground for corn; and by theſe methods he may vary his crops as he pleaſes, and give his ſeveral grounds what years of reſt he thinks proper, before he brings them on again to a new ſucceſſion of corn, in a new round of tillage.

The paſſion for the plow is very great, and for wheat in particular, as it is the beſt, and moſt profitable grain; but other crops will often be found more beneficial than wheat in too quick a ſucceſſion.

As to the profit of reſpiting the wheat crop only for one year, I will calculate the reſpective gain which may be expected from wheat crops in twenty years, when ſowed each fourth year, and when ſowed each fifth year during that period; in which the longer the intervening time is between, the better the crop will pay.

In the firſt method there will be five returning crops of wheat in the twenty years, and three years between each crop to improve the land; and it cannot be reaſonably ſuppoſed to produce above twenty quarters, that is, four quarters each wheat year.

In the other method there will be but four crops of wheat in the twenty years, which, with the ſame method of huſbandry, and one fourth more time, muſt be the better prepared by one fourth part for producing a better crop: this then muſt be five quarters each four wheat years; which will amount to juſt the ſame quantity of twenty quarters in the ſaid twenty years.

This is not only agreeable to reaſon, but to what we experience in the courſe of huſbandry; and the crops in general are better or worſe, according to the time allowed betwixt the freſh ſowing again of the ſame ſort of grain.

Suppoſing the profits equal in the caſe of the four years of wheat in the twenty, there will be the ſeed and huſbandry of one year ſaved; and as it is probable clover might be continu'd the year wheat was omitted, or a crop of turnips got; ſuch a crop, and ſuch a ſaving may moderately be eſtimated at two pounds ten ſhillings.

The ſubſtance of all the modern improvements, is principally owing to clover and turnips, each of them producing great quantities of ſuſtenance for cattle, and preparing the land for corn.

Thoſe therefore deſerve to be treated in a more full manner.

And ſince wheat is the principal grain, and the moſt profitable, and clover and turnips are the beſt preparatives for it; we ſhall conſider wheat, clover, and turnips as the three chief kinds; and do juſtice reſpectively to their uſeful qualities. We ſhall thus take in the principal part of all what concerns the old tillage, and all the material alterations and improvements made by what is called the new.

The new huſbandry prevails principally in the ſouth parts of the kingdom, and travels but ſlowly northwards: conſequently it muſt, at preſent, very much affect the north country farmers, and their landlords in courſe ſoon after; for if, by this new method, the ſouth farmer can produce on the ſame ground, one fourth more profitable grain, graſs, and root, in the circle of ſix years, he will be able to underſell the northern, and conſequently the farms fall there in their value.

The ſame remark may be made in relation to the vale grounds and uplands; for ſince ſuch great quantities of good hay have been obtained in the uplands, by the aſſiſtance of the foreign graſſes, this muſt ſink the value of the hay got in the vales.

The ſame obſervation may be made on the the rich dove-bank lands, and others of the ſame nature, which were formerly ſo valuable for their feeding of cattle early and well, that they bore an exceſſive price; but ſince the many improvements made by lime, by which many other places are brought to feed all ſorts of cattle very well, thoſe high-prized lands have ſunk conſiderably in their value.

If the northern farmers ſhould go into the new improvements, as their lands and expence are cheaper than thoſe in the ſouth; they might have the advantage over the ſouth country farmers.

We ſhall conſider the ſeveral ſorts of grain, graſſes, and roots ſeparately, and begin with the moſt valuable grain, which is wheat.

Wheat is of ſo an excellent a nature, and of ſo general uſe, that it cannot be ſufficiently taken care of as to the culture and management: we ſhall treat of it firſt in general, as it really is what it is frequently called, the King of grains; and we ſhall then conſider the ſeveral ſorts of it in particular, and the culture, management, and produce of it; by which the reader will be inſtructed in its nature, as it is a very curious grain.

Of wheat in general.

Three things chiefly make any thing eſteemed amongſt men. Firſt, the real uſe and benefit of it. Secondly, the eaſe with which it is to be acquired. And, Laſtly, the intrinſick excellency of its own nature. All which properties, wheat has in a very eminent degree.

Wheat not only in general ſupports the life of the greateſt part of mankind, but ſupplies us with numerous other conveniences; affording us ſtrength, health and pleaſure. It alſo makes excellent malt. It grows in almoſt all countries, and in ſuch a variety of ſoils, that few places need want it.

As to the eaſe with which it is to be acquired.

Two things may properly fall under our conſideration:

Firſt, the uſual labour and expence neceſſary for the obtaining a crop of wheat. And,

Secondly, The quantity it generally produces.

The expence and labour neceſſary to procure it, are ſo well known, that they will not deter the farmers; they being generally ſo full of the expectation of the profit of it, as to want no encouragement to attempt the cultivating it: depending on the profit of a crop of wheat to pay two years rent, and the huſbandry neceſſary for the three years in the old courſe of tillage. The particulars in this reſpect, will fall under conſideration when we treat of the means preparative to it. On a general eſtimate, ſuppoſing two years rent and accidents one pound five; plowings, ſowing and reaping one pound five; ſeed and weeding fifteen ſhillings; manuring it one pound fifteen. This whole expence would amount to five pounds; and reckoning the farmer to have but four quarters and a half, and that to be ſold at thirty ſhillings, he is paid for all his labour, and has one pound fifteen ſhillings profit: for the ſtraw is ſufficient to pay for the thraſhing.

Of the quantity of the produce of wheat.

If we conſider what great quantities of wheat have been produced in ſome extraordinary inſtances; and what may reaſonably be expected from it in a courſe of good huſbandry; what has been before mentioned will appear a very moderate computation of the profits.

“ Nothing, ſays Pliny, is more fruitful than wheat, from “ one buſhel one hundred and fifty are produced; and the “ procurator once ſent to Auguſtus one grain which had a- “ bout four hundred ſtems; and another was ſent to Nero “ which had three hundred and fifty.”

“ Among the many contrivances for food, ſays Dr. Der- “ ham, I cannot but attribute that univerſal aliment, bread, “ to the revelation; or, at leaſt, the inſpiration of the Creator, “ and conſervator of mankind; not only becauſe it is a food “ uſed in all or moſt parts of the world; eſpecially becauſe “ it is of incomparable uſe in the great work of digeſtion, “ greatly aſſiſting the ferment, or whatever cauſes the dige- “ ſtion of the ſtomach.” Of which take this example from the noble Mr. Boyle, “ The extracted menſtruum from “ bread alone, that would work on bodies more compact “ than many hard minerals; nay, even on graſs itſelf, and “ do many things that aqua fortis could not do: yet by no “ means was this ſo corroſive a liquor as aqua fortis, or “ as the other acid menſtruums.” The way of preparing this is deliver'd in Harris's Lexicon.

We need not go ſo far back for inſtances of fertility of wheat. Mr. Evans, of Southampton, had from one corn eighty ears, containing about four thouſand grains, ſome had ſixty, and ſome had ſeventy grains; and he had on the whole about ſix and twenty quarters on an acre, when the corn was ſet at ten inches diſtance.

Mr. Hamilton mentions, that on trying Mortimer's receipt for ſteeping wheat in water, pigeon's dung, nitre, &c. though but little of it appeared above ground, what came up branched ſo, that he could number forty ſtalks from one grain; and every head was very long, and the grain large; "I planted it, ſays he, about ten inches diſtant, I don't "doubt if I had given half the ſeed, that I ſhould have had a very large crop."

There have been ſeveral inſtances of the ſame nature, but not to inſiſt on extraordinary caſes; we know of there being now eight or ten quarters or more on an acre in Cheſhire, and in other places, on lands well huſbanded and carefully managed. Miller mentions eight or ten ſtalks from one corn, and eight, ten, or twelve quarters of wheat on an acre as no uncommon thing, both in his own caſe and in that of others: which he has ſeen and obſerved.

This laſt ſummer I have taken up wheat both in Hertfordſhire and Eſſex, with eight ſtalks from one corn; ſome of which had thirty odd corns in an ear, and ſome above forty, which ſome of the owners had never obſerved, but then counted, and only before thought the corn heavy: fifty to a ſtalk comes to Mr. Evans's calculation of four thouſand for one; and at eight ſtalks, forty five in an ear, will be three hundred and ſixty from one.

The ſeveral calculations after mentioned, from the grain when ſet at different diſtances, will give the reader a clear notion of what produce may reaſonably be expected from an acre of land as differently ſown. And we ſhall only here add the caſe of Mr. Yelverton in Ireland, who had the reward allowed for the perſon who ſhould produce the moſt and beſt wheat on an acre of ground in that kingdom; by which the reader may ſee what may be gained by a proper management, in the method that gentleman took in the ordering of it.

Mr. Yelverton in 1742, had the prize in Ireland, having ſix hundred ſixty eight ſtone and eleven pound of wheat off of one acre.

The method he took was to change his ſeed; then he ſowed it not too thick; and he mowed it.

The ſeed was ſteeped the evening before the ſowing it in a pickle, and he riddled hot dry lime over it.

The pickle was thus made:

Take rock lime and bay ſalt, put them together in a large veſſel;

veſſel: then throw in a ſufficient quantity of urine, ſtill ſtirring them till it diſſolve the ſalt, and ſlake the lime; let them continue twenty-four hours, and then let the liquor run out into another veſſel for uſe.

The corn ſhould remain from night to morning in this pickle before ſowing.

The liquor prevents ſmut, and deſtroys a pernicious inſect, called the ſmall red worm, often deſtructive to ſeed, eſpecially in rich grounds.

In this caſe the lime and bay ſalt alter the effects of the urine, which, when uſed alone, is ſubject to prevent the wheat from growing. This I have alſo experienced in ſome trials of that kind, though at the ſame time I have found the ſeed grow when the urine has been mixed with half water.

We ſhall now proceed to conſider this grain in a more particular manner, by tracing it from its origin in the ſeed to its full maturity. In this courſe we ſhall comprize whatever is neceſſary to be known relating to it under the following heads.

In the firſt, we ſhall conſider its nature with the manner of its growth.

In the ſecond, what ground is proper for it.

In the third, how ground is to be prepared to be moſt agreeable to it.

In the fourth, how the wheat is to be prepared for the ground.

In the fifth, how they are to be ordered while the crop is in the ground.

And laſtly, how the wheat is to be managed when taken from the ground.

Before we enter into its nature and growth, it will be proper to give a deſcription of it, and to mention the ſeveral ſorts of it moſt commonly propagated.

Wheat is an annual plant, tall and ſlender in the ſtalk, with graſſy leaves and a heavy ear; the root is fibrous, and the ſtalk hollow. The conſtruction of the ear is this. Each huſk is compoſed of two leaves, or valves, which are of an oval form, and generally contain three flowers. Each flower is compoſed alſo of two valves; the outward one belly'd, the inner flat. In this ſtand three filaments, with little duſty knobs ſplit at their ends. In the center of theſe is placed the rudiment of the grain. From this riſe two filaments, which are feather'd at the top: theſe catch the male duſt that afterwards impregnates the ſeed. The ſeed ripens by degrees after this, and the two valves of the flowers retain it till it is ſeparated by time or force.

The ſeveral ſorts are;

Firſt, white or red wheat, without awns. Second, the red wheat, in ſome places called Kentiſh wheat. Third, white bearded wheat. Fourth, red ear'd bearded wheat. Fifth, cone wheat. Sixth, grey wheat, in ſome places called duck-bill wheat, and grey pollard. Seventh, Polonian wheat. Eighth, many ear'd wheat. Ninth, ſummer wheat. Tenth, the wheat called naked barley. Eleventh, ſix rowed wheat. Twelfth, long ear'd wheat. Thirteenth, white ear'd wheat.

Theſe are ſtrictly ſeminal variations, not diſtinct ſpecies; nor are ſeveral of them of any moment; but we thought it proper to mention them all in a work of this nature.

The firſt ſix commonly grow in England; but the firſt, the fourth and the fifth, are the beſt worth cultivating; being hardy, and affording a great quantity of flour. The cone wheat is to be preferred to all, as having a larger ear and fuller grain than any other, and it is the kind moſt ſowed near London.

Some prefer the third on account of the extreme whiteneſs of its flour, and ſome the bearded, as thinking it leſs ſubject to mildew; but of this there is no certainty.

The Polonian wheat is little cultivated now to what it was formerly; nor is there any reaſon known why it is omitted.

The eighth is little cultivated here, tho' much in Italy and Sicily: ſome ſtalks of it have ſeven ears, and it has commonly three or four. This often occaſions its being laid.

The ſummer wheat is ſown in the ſpring, and is ripe as ſoon as the other; but not producing ſo great a quantity of flour as the others, it has been neglected, though it may be proper when the other miſcarries.

The tenth ſort is little cultivated, the grain being thin, and the flour coarſe; but it is hardy, and will grow upon any ſoil.

The ſix rowed wheat is not very common, the ears are ſhort, and have each ſix rows of grains in them.

The twelfth ſort is cultivated in ſeveral parts of England, and more in Wales; the grain is pretty long, but not ſo full as ſome other ſorts, it has a greater quantity of chaff, and the awns of it are as long as thoſe of rye.

To theſe we ſhall add the following varieties.

1. Egg-ſhell wheat; this is reckoned beſt for light lands, and to be mixed with rye for maſlin, it being early ripe.

2. The double-eared wheat; this proſpers beſt in a heavy clay, or a loamy ſoil.

3. The red or Kentiſh wheat; this is much ſown in Hertfordſhire.

4. The great-bearded wheat, which thrives well on a heavy clay.

5. The white pollard wheat.

6. The flaxen or lammas wheat.

Egg-ſhell wheat is reckon'd the beſt for yielding the whiteſt flour, and making the beſt bread; it will grow well in a loamy earth, and in gravelly, chalky, and ſandy loams; it ſuits light lands beſt, and is generally early ripe.

As to red lammas; as wheat is the king of grains, ſo this has been eſteemed hitherto the king of wheats. It grows beſt in the richeſt vale lands, or on blue clays, where I have ſeen it near five foot high: it is ſown alſo by many in up-land dry loams, and even in ſome gravels, that have been before dreſſed extraordinary well. This is that noble ſort whoſe kernels are ſomewhat longer than perky wheat, and near as big as cherry ſtones. When ſown in a right ſoil, will outweigh perky, but it turns not out ſo much flour. It is ſix inches taller, and ſo is ſubject to fall.

Yellow lammas has a white ſtraw, and a red ear; the flower is near as white as that of the other lammas; it will grow on chalks, gravels and clays, and other poorer lands better than lammas.

Perky has a white ſtraw, a white ear, and a red or yellowiſh kernel, more round than the lammas. It comes into repute as it will do well in chiltern grounds, chalky and gravelly ſoils, well dreſſed; it will grow in poorer ground, and turn out well, and is not ſo ſubject to blight. The vale farmers now find it yields more than lammas, is hardier, and will grow in a courſer tilth, and will do with leſs dreſſing. It bears late ſowing beſt, and is fit to be ſown after artificial graſſes, peaſe, beans and turnips with one plowing.

White wheat has a white ſtraw, and a white thick ear; its kernel is as big as perks. It grows cloſer together than red lammas, and ſo is better ſecured from blights. It has alſo two or three chaffs, which ſecure it againſt flies. It thrives well in incloſed, poor, gravelly, chalky and light loamy ſoils; and is much ſown and mixed with red or yellow lammas: it weighs lighter, but makes more flour than the perks or lammas. Bakers mix them. It will grow well both in vale, ſwampy and ſtiff ſoils, and in chiltern dry grounds.

Duck-bill or dugdale wheat has ſeveral other names, and has a darkiſh brown guttery kernel, rather bigger than other wheat; the chaff, by its ſharpneſs, hurts the horſes mouths. It is ſown in vale chiltern ground, in wet and dry loams, which are made rich with manures, for a poor ſoil agrees not with it; it is bulky and ſubject to fall, but folding on it makes it ſtand.

When ſown on a fine well dreſſed tilth, it produces a great deal of grain; its flour is of the coarſeſt and heavieſt ſort; it may be ſown in October, and even to February or March you may ſow any of the pirks or white wheats.

There are ſeveral other good wheats in different parts of the kingdom, known under various names; and ſeveral of the above-mentioned ſorts are called by different names in various places; ſeveral of them are alſo ſo mixed in ſowing, that many large farmers are not acquainted with the diverſe ſeparate ſorts, or their proper names: nor is there any objection made to their mixed corn when brought to Bear-Key.

That called cone wheat is a good ſort, but the London Bakers think it too ſweet; they buy it in flour, and whiteneſs being a great article, they prefer the red wheat, and mix them, if neceſſary. Thoſe who will not go to the price of the beſt, put in allum, which gives the bread a whiteneſs, but a poor dry taſte.

The Perſian wheat may be mentioned as a curioſity, it having five heads on one ſtalk, one in the middle as long as the ears of our wheat, and two on each ſide about an inch long; it is raiſed ſometimes in the gardens of the curious: Mr. Hamilton planted ſome of it on his coldeſt ſoil in Scotland, having firſt mix'd unſlacked lime with horſe dung prepared ſome time before, with the earth it was planted on, which brought it to its full maturity.

All farmers agree that ſome of theſe ſorts of wheat thrive beſt on ſtrong ſtiff land, and others do beſt on a light ſoil; ſo that the farmer muſt ſuit his wheat to his ſoil, or prepare his ſoil to ſuit the grain.

There is frequently a great variety of ſoils in lands lying together; nay, in one and the ſame cloſe at a little diſtance;

ſandy ſoils on the one ſide, ſtiff on the other, wet and oozy in the middle.

We ſhall proceed to treat of theſe, but firſt conſider how corn grows.

Experiments have been made on ſeveral grains; and ſeeds of various ſpecies have been cauſed to vegetate in the air, without any aid or aſſiſtance from the earth.

The ſeed on theſe occaſions is laid on wool, ſpread on a plate with holes in it; on the mouth of a larger veſſel filled with water.

I have tried the experiment with a brown pot full of holes, placed over, or rather in a larger veſſel near full of water; the warmth of the ſun raiſes a quantity of wet into the air; which, in this caſe, muſt paſs through the holes in the brown pot, and ſo keep the wool moiſt. And it is alſo found, that all water ſo carried up, conveys ſome earthy particles.

In a few days the wheat, grains, and ſeeds will begin to vegetate; and extend, by ſlow degrees, their roots towards the water, where they imbibe, however, a leſs quantity of juices than they would from the earth. Yet they will proſper in that ſituation.

When a ſeed has been two days in the earth, the juices with which it is ſwelled are imparted to the bud, and cauſe it to grow.

The bud is ſituated in one of the extreme parts of the ſeed, and that part which lies neareſt the ſurface is the ſmall root of the future plant.

The ſubſtance of ſeeds conſiſts of two pieces, generally called lobes, and which at firſt are united by one common covering; the ſtructure whereof is more or leſs ſolid. Theſe after ſeparate and ſerve as ſeminal leaves of the plant, and then they wither and decay when the plant has no farther occaſion for them; and theſe obſervations may ſoon be made of divers ſpecies of beans and peaſe.

The bud of a grain of corn which has been lodged in the ground, begins in about four and twenty hours to burſt its foldage, and to diſengage itſelf; after that it ſhoots out its roots and ſtem.

The root at firſt is incloſed in a ſort of a purſe, through which it breaks its way: two other roots within the ſpace of a few days ſhoot forth from the ſides, and each of them burſts through the covering wherein they were infolded.

Theſe three roots are ſhagged with a vaſt number of filaments, which wind themſelves about the little clods of earth which they meet with in their progreſs. By this cloſe adheſion they draw whatever is nutrimental to the tender plant. The ſtem ſhoots upwards in a perpendicular line.

Corn will begin to ſhoot a ſmall verdant point out of the ground in five or ſix days.

This little ſtem is no more than a ſmall parcel, or packet of leaves folded one upon another all round the ear; which remains for ſome conſiderable time inviſible, and is lodged in the heart.

Tho' the firſt leaf of this packet opens a little toward the point, yet the lower part is always confined, and rolled up in the hard teguments from whence it ſprings.

Some few days after, the covering of the ſeed begins to waſte away, and the purſe wherein the roots were contain'd, decays and dies when it has performed its offices.

When the leaves are duly unfolded, we may perceive the firſt draught, or imperfect ſketch of four tubes, which form the ſtem; and at the bottom we may likewiſe diſcover the bud of the ear.

From the firſt knot which lies neareſt to the roots, ſhoots out a leaf, which performs the function of a covering to a ſecond tube; at the third knot begins another leaf, which covers the fourth tube and the ear.

The interſtice between the firſt and ſecond knot neareſt the roots, is then much larger than that which ſeparates the ſecond from the third.

On theſe tubes thus jointed as it were or ſet one into another, the ear riſes; which may be diſtinguiſhed with eaſe by its round tranſparent grains, which bear the reſemblance of ſo many little pearls.

At length the ear ſhoots from the foldage which ſkreened it from the air, and the ſeveral bags which are appointed to contain the ſubſtances of the future grains, begin to be dilated.

Theſe ſhoot out ſlender bodies for the reception of the powders from the chives, which make their appearance above, and render the buds prolifick.

When the buds have dilated in thoſe lodgments, that mealy ſubſtance to which they are united by ſeveral filaments, the foldage and the firſt leaves, which extracted from the earth and air ſuch juices as were proportioned to the delicate ſtructure of the ſtem, begin to waſte away.

The ſtem then operates more powerfully, it exhauſts from the leaves their nutritious juices to enrich the ear.

It is matter of admiration, that ſo valuable an ear ſhould be ſupported by ſo tall and ſlender a ſtem; planted in the midſt of an open field, where the winds have full power to plow it down.

This ſtem often aſcends to the height of four or five foot from the ground; and though it has no more than two twelfths of an inch for its diameter, yet it is contrived according to the ſtricteſt rules of good œconomy; for by this means a ſmall field will contain an infinite number of ears.

The ſtem, however, as ſlender as it appears to be, has been formed with ſuch art and ingenuity, that it is thereby preſerved for ſeveral months ſucceſſively unhurt; notwithſtanding its being openly expoſed to ſtorms and tempeſts, and to all the various fluctuations of the air.

Four knots of a hard ſubſtance reſembling the ſame number of ſtrong bands, make it as firm as it is neceſſary, without rendering it in the leaſt unpliant: it is flexible enough, and qualified to bow without breaking not only under a common gale of wind, but even under the ſhock of the moſt ſudden and impetuous blaſts.

By the aſſiſtance of its knots it is enabled to recover its firſt poſition, as ſoon as the ſtorm is over; and it is a very agreeable ſight to view this foreſt of ears under a gentle agitation of the wind: each ſucceſſive breath of air makes them bow in their turns, and ſeem to roll along the field like the waves of the ocean.

The ears are formed with no leſs art and judgment than the ſtem; the grains which are in them are ranged one above another, at equal diſtances, in order that they may receive an equal proportion of nouriſhment and ſupport. They are alſo concealed and ſecured under various teguments, which are thick enough to break the force of the ſun's beams, and are ſo cloſely joined together, that they can exclude and throw off thoſe dews and rains which would otherwiſe oblige them to ſhoot out.

Several of theſe teguments terminate in as many points of different ſizes; which are ducts or channels, intended to introduce into each lodgment a ſufficient quantity of air.

I am apt to believe theſe points, or beards of corn, are deſigned to withſtand and break the force of thoſe heavy drops of rain which fall upon them; by which means they are diſcharged from each ſide, and from the ſurface, inſtead of penetrating to the bottom of the lodgments of the various grains.

The proceſs of nature in the vegetation of plants, as exemplified in a grain of wheat, is as follows.

The firſt day the grain is ſown it grows a little turgid, and the huſks gapes in ſeveral places, and the body of the plant ſwells, and the gem or ſprout opens and encreaſes, the roots begin to bunch out, and the placenta, or ſeed leaf becoming looſe, gapes.

The ſecond day, the ſecundine or huſk, being broken through the ſtem or top of the ſtraw, appears on the outſide, and grows upwards.

The third day the pulp of the conglobate, or round leaf, becomes turgid with the juice it has received, from the earth fermenting with its own.

The ſtem from whitiſh turns greeniſh, the lateral roots break forth greeniſh, and the lower roots grow longer, and hairy, with many fibres growing out of it.

Hairy fibres hang all along on all the roots except on the tops, and theſe fibres wind about the particles of ſoil like ivy, whence they grow curled; above the lateral roots two other little ones break out.

The fourth day the ſtem, mounting upwards, makes a right angle with the ſeminal leaf, the laſt roots put forth more, and the other three encreaſing have more hairs, which cloſely embrace the lumps of earth, and where they meet with any vacuity, unite into a kind of network; the leaf is now ſofter, and when bruiſed yields a white ſweetiſh juice, like barley cream.

The fifth day the ſtalk ſtill riſing puts forth a ſtable leaf, which is green and folded, the roots grow longer, and there appears a new tumour of a future root; the outer huſk, or ſheath, is looſened, and the ſeed leaf begins to fade.

The ſixth day, the ſtable leaf being looſened, the plant riſes upwards, the ſheath ſtill cleaving round it like a bark; and the ſeed leaf is ſinuous or wrinkled, and faded.

After the eleventh day the ſeed leaf, as yet ſticking to the plant, is crumpled and almoſt corrupted, within it is hollow; and about the ſecundine, the mucus and white ſubſtance of the ſeed being continued to the navel knot, form a cavity; all the roots becoming longer put forth new branches out of their ſides. The ſecond leaf withers, and its veſicles are emptied; the ſpaces between the knots grow longer; new gems appear; and the middle root grows ſeveral inches longer.

After a month, the roots and ſtalk being grown much longer, new buds break out at the firſt knot, and little tumours bunch out, which at length break into roots.

The roots which grow are generally according to the goodneſs of the ground, and the compaſs allowed for the grain of corn to extend itſelf in; Miller ſays, he has traced a root to the extent of a yard, which is farther than I could ever trace one; but with the allowance which may be proportionably made for the very fine threads, which could not be taken up. I think I have found ſome extend two foot in length or near it.

Four, five, or ſix ſtems are what is commonly to be met with in the uſual courſe of huſbandry; each contain, if tolerably good, from thirty to forty grains or upwards; as I have counted them this ſummer both in Hertfordſhire and Eſſex.

I have ſometimes met with eight ſtems from one grain, in corn ſown in the common way which is about three hundred for one; but that is not uſual. We ſhall have occaſion to mention this again when we come to compare the different produce ariſing from various grounds, and from grain ſowed at different diſtances, in one and the ſame grounds; we now ſhall proceed to our ſecond head: that is,

How the ground is to be prepared for wheat.

This being a point of the utmoſt importance to the farmer, requires a particular conſideration; eſpecially as the new huſbandry gives a quite different method of management in this matter; and more eſpecially as ſome new ways of proceeding in this article have very lately been introduced, and are juſt now ſtruck out by ſome ingenious farmers, which very well deſerve to be ſet before the reader.

The uſual method of preparing the ground for wheat, was formerly by plowing it three, four, or five times, and dunging it when neceſſary. This, in general, anſwered very well, when proper regard was had to the nature of the ſoil, and the different ſeaſons which happen; ſince it has been found, by repeated experience, that both froſts and ſnows have great influence on corn land, both in reſpect to the neceſſary plowing it, and alſo as to the certain enriching it when the ſnow falls and lies on it.

Froſts, when to any moderate degree, lightens the ground ſo much, that the uſual plowings have a much better effect on it for wheat; and when it continues any time, it makes the laſt plowing unneceſſary, or indeed improper for ſome ſorts of ground. Miller is of opinion, that the ground for many years after the great froſt, required leſs plowing than it did before.

Froſts not only lightens the earth, as before mentioned, but makes it more ſuſceptible of the air, which certainly not only conveys an unaccountable quantity of rich nouriſhment into the ſoil; but by its working power ſtills looſens and fines the particles of it after a very extraordinary manner; for tho' it may be hard to ſay what it is, or however difficult it may be to name or deſcribe it, the beneficial effects of it are found beyond diſpute; which are ſo great, that ſome writers and farmers are of opinion, the great benefit of plowing is to make the earth more capable of receiving the air and dews; the truth of which every one may be convinced of, who will conſider the riches acquired by fallowing. It is common to ſee, in many places, land worn out with tillage, made again proper for it, by only lying ſome years uncultivated.

A proper fineneſs is neceſſary; but this, in many caſes, might be effected without many plowings.

The air, rains, and dews, are replete with great particles, which have ſurprizing effects both in and upon the earth, and in and upon vegetables.

Dr. Hale found, that a cubic inch of blue clay being diſtilled, an hundred and eight cubic inches of air were raiſed from it.

The air is very operative in every part of nature, whether animal, vegetable, or mineral.

Common air is frequently impregnated with noxious vapours, thus the fumes which aſcend up in the air from fermenting wines are pernicious, and thoſe from burning brimſtone deadly.

It is by the amphibious property of the air the principal operations of nature are carried on; for a maſs of mutually attracting particles, without being blended with a due proportion of repelling ones, would ſoon coaleſce into a ſluggiſh lump.

Mr. Boyle mentions to what a great number of miles an inch of air may be rarified, and the force of fire engines are viſible now in moſt countries.

If any perſon has a mind to ſee the effect of water expanded, he may juſt wet a bullet mould, and then pour in a little boiling lead, which will fly out with prodigious force; I have ſeen it ſtrike into a ſolid ſtone, but whoever tries it muſt be careful to ſecure themſelves, and all about them, from the danger of its flying on them, if the hole be toward them.

We ſee the great power of expanding water, when heated in the engine to raiſe water by fire; and water with air and other active particles, in capillary tubes, and innumerable ſmall veſicles, doubtleſs act with great force, though expanded with no more heat than what the ſun's warmth gives them.

Peaſe in a pot near full with water, on imbibing the water, have raiſed one hundred and eighty-four pound weight laid on them; by which we may ſee the vaſt force with which ſwelling peaſe expand. And doubtleſs a conſiderable part of the ſame, is exerted not only in puſhing the plume of a plant upwards into the air, and enabling the firſt ſhooting radicle of the pea, and other grain, and all the ſubſequent under fibres, to penetrate and ſhoot into the earth.

Though we have from theſe experiments, and common obſervations, many proofs of the expanſive force with which the fibrous roots of plants ſhoot; the leſs reſiſtance they find, the greater progreſs they will certainly make in equal times.

Hence one of the moſt conſiderable uſes of plowing, fallowing, and trenching, and of harrowing of ground, and of mixing compoſts, is to looſen and mellow the earth, that not only the roots may make eaſier ſhoots, but there may be a freer and readier admiſſion of the dews, rain, and air.

Notwithſtanding this, a proper ſtiffneſs of the ſoil, ſuitable to the grain ſowed, muſt alſo be preſerved; otherwiſe wheat, and ſome other grains, will fall. To prevent this, farmers frequently roll the ground when neceſſary, and ſometimes fold the wheat with ſheep.

Could we find out what ſtiffneſs each grain requires, and the degree and ſort of rich nouriſhment moſt ſuitable to them, tillage would be managed with greater eaſe, with much more certainty of ſucceſs, and with greater profit.

Theſe are brought to a tolerable degree of certainty, as to the nature of lands proper for wheat, beans, and ſome other grains; and ſome general rules of fitting lands by proper quantities of marle, lime, chalk, ſoot, and aſhes, are pretty well aſcertained; yet there is ſtill a large field open to the thinking farmer, for the better proportioning his manures to his lands.

It may not be improper to caution the farmer, againſt over-manuring his land; for when land is made too rich, he will not meet with a good crop of corn, but is ſure to find a plentiful one of ſtraw. This is the reaſon why farmers, when they are to break up rich land, generally firſt take off the edge of it (as they call it) by firſt ſowing it with oats, before they ſow it with wheat; and a very good farmer aſſur'd me, that he had loſt above fifty pounds in his younger years, by making his wheat land too rich.

Marle, lime, chalk, and ſalt, are in themſelves excellent preparatives of the ground for wheat, when properly applied; but what is peculiarly beneficial in theſe is, that they convey no ſeed of weeds, no inſects or pernicious vermin, but rather deſtroy them.

For example, clover, which is an admirable preparative for wheat, requires no ſuch culture or manure, as will give any annual or other weeds an opportnnity of running to ſeed; if the farmer ſhould lay a little fine dung on it at Michaelmas or in February, yet the clover being almoſt perpetually mowed firſt, either for ſeed or graſs, that early mowing will cut off any weeds which may get in it, before they can ſeed. As the tops of clover are generally large and flouriſhing, they overſhadow and keep down weeds: if any ſourneſs ſhould be conveyed by ſuch a manure, the clover tops, and deep roots, will mellow it before it is plowed up for wheat, for which one plowing is commonly ſufficient.

The ſame may be ſaid of turnips, whoſe large head overſhadows and keeps under weeds; and the repeated hoeings neceſſary, clear the ground, at the ſame time that their large roots are ſold to great profit, or prodigiouſly enrich the ſoil, and frequently anſwer both thoſe purpoſes.

Beans and peaſe are alſo excellent preparatives for wheat. And here I ſhall mention a very extraordinary inſtance in the courſe of huſbandry, begun by a farmer near Chelſea, this ſpring.

He ſowed his ground with peaſe in rows as uſual, at about twenty inches diſtance; and when the peaſe were grown up a little, he ſowed the interſtices betwixt them with turnips, and after let the peaſe reſt on the tops of the turnips; he after reaped the peaſe, and ſold part of the turnips; and on the twenty-ſecond of this October I ſaw two teams plowing this ground; one of which, with ſix horſes drawn double, plowed up a furrow of eleven inches deep, and twelve broad; and the other, with two horſes, followed and plowed the rubbiſh about two inches deep, turning it, and all the remaining turnips, into the bottom of the great furrow.

Many of the turnips plowed in were very very large, and few leſs than apples; the ſervants told me their maſter thought the turnips would be as good as half a dunging, and he intended to ſow it as it now lay, and then to harrow it. There was no appearance of any rubbiſh on the top of all that was finiſhed by the plows.

What the ſucceſs may be cannot be foretold, but in this procedure, there appears all the ſubſtantial benefit of horſe-hoeing, as well as of giving the wheat that diſtance, which we are promiſed will procure us ſuch advantageous crops; the furrows being a foot diſtant from each other, betwixt which moſt of the corn will fall, after whatever manner it is ſowed.

From this experiment, a judicious farmer may take ſeveral hints which may be of great ſervice, in other articles.

Lentils, and ſeveral other grains and graſſes, are very good preparatives for wheat, when plowed into the ground, or eaten on it, which different farmers order according to their inclinations; and all may be of uſe for wheat, as will be mentioned when theſe articles come to be conſidered: wheat does not well follow common barley, as it makes the land too light, and alſo takes too much of its goodneſs from it: it ſeldom does well, tho' the ground be in good heart.

I ſhall mention one article more under this head, which is that of plowing.

The Herefordſhire farmers plow five times for wheat, ſhallower or deeper as occaſion requires: and all agree it is improper to plow in rain or ſnow.

The mode of plowing ought to be varied according to the nature of the ſoil, and the early or late ſowing. And it is a common ſaying, ſow early and have corn, ſow late and have ſtraw.

There is another common rule ſaid to be a ſtanding one in huſbandry, viz. The more thoroughs the greater the crops; which may be admitted as far as the ſoil is more broke and made finer by that means. But it occaſions the ſeeds to fall cloſer to each other, and ſo far it diſagrees with the modern method of ſowing leſs ſeed, and at a much greater diſtance than is uſually done, which is now ſo much preferred to all other ways.

About Dunſtable they plow much in ſtitches; and in Eſſex ſome very good farmers practiſe this method with great ſucceſs; making five ſtitches when they come to ſow, which five make a perch; ſo that between every two ſtitches there is a thorough a foot wide.

They ſow theſe ſtitches length-ways by hand, and a perſon uſed to it will ſow for two teams, each of which plows an acre and an half a day; and when they have done the neceſſary plowings, they run a ſmall plow drawn by a ſingle horſe, along every thorough, which caſts the fine mould and corn each way on the ſtitch, and leaves the thorough clean.

By this method, and ſowing ſparingly, they apprehend they have all the advantages they are promiſed by the drill plow; and the benefit of their wheat having ſufficient room for its growth; eſpecially as there are ſo great ſpaces left at each ſide of the ſtitches.

Pliny mentions the plowing ground eleven times, which is thought ſtrange; but there are two good farmers here who have ſeveral times plowed their ground as often: and as ſoon as the ground is cleared from the corn, conſtantly apply the plow to it, and repeat it every fortnight or three weeks, whilſt the weather will allow, in order to give the earth the benefit of the ſun, air and dews; and to extirpate and prevent the growth of weeds, which grow beſt at this time. By this repeated huſbandry they have cleared their grounds ſo well from weeds, that I this year ſaw fields of wheat without a weed in the ſheaves, or one growing in the field: and one led his wheat immediately after it was ſhorn. By this method they never have any ſmut or blighted corn; though one of them uſes no ſteeping: and the land is ſo mellow, that two horſes and a man plow an acre and half a day with great eaſe; ſo that in reality, they have no more trouble than thoſe who plow leſs with ſtronger teams, and a boy to drive.

How the wheat is to be prepared for the ground.

Under this head there are two things to be principally regarded.

What ſort of ſeed is to be procured; and what quantity is neceſſary. And next, how that ſeed is to be ordered.

The uſual allowance for wheat has been named already; whoever approves of the drill way of ſowing, ought to ſow leſs ſeed than is commonly allowed to an acre; as it comes nearer in appearance to the drill method of huſbandry, which allows the greater advantages to the ſeed of more room for the ſun, air, dews, and rain; and greater compaſs to ſpread the roots in the earth. In the common way of ſowing, regard is to be had to the time: a peck leſs will do in September than after; and a peck more than common is required in gravelly, and new broken up grounds: great allowances muſt be made in ſome places for the damage done by vermin, which frequently devour or carry off the ſeed, whilſt others are ſpoiled by lying expoſed to the ſeverity of the weather.

The ſucceeding calculations of what produce may reaſonably be expected from wheat ſowed at ſeveral diſtances, may probably give the reader ſo clear a notion of this matter, as to guide him in his conduct.

Why may not wheat be hoed at ſuch diſtances as the owner pleaſes, as well as turnips? Is not the ſame reaſon that ſatisfies us of the prudence of our conduct in the one, as ſtrong and forcible in the other? The farmer before named ſpoke of hoeing his wheat as well as his turnips, but he has not yet ventured to cut up what I would call the ſuperfluous wheat; though he finds the hoeing it not only to anſwer as to the clearing off the weeds, but alſo as to looſening the ſurface, and refreſhing the wheat. Sure the hoeing wheat to eight or nine inches diſtance, could be no hazard of making it too thin; and this near the thoroughs would anſwer the diſtances propoſed by thoſe, who ſeem deſirous to allow the largeſt compaſs of ten or twelve inches for each plant to ſpread in.

Why might not the ſpare wheat in one place be tranſplanted to vacancies in others; or even to freſh ground prepared for it?

A good hand with a trowel would tranſplant ſeveral hundreds in leſs time, and at a leſs expence than moſt readers would imagine; and wheat may certainly be tranſplanted very well: I named a trowel, becauſe that when it opens the ground for the wheat, hardens not the ſides of the holes as ſetting-ſticks do, but leaves the earth looſer for the wheat root to ſtrike freſh in.

Every farmer knows wheat will bear mowing at proper ſeaſons without prejudice. It will bear trampling on by ſheep, when folded properly upon it; and the roller is frequently alſo uſefully applied; and I know it will bear being tranſplanted, and if prudently done at a proper ſeaſon, and in ground ſuitable for it, a man would preſently tranſplant an acre at a foot diſtance: the hazard could not be great, and the profit of its ſucceeding would be very conſiderable.

As to the choice of ſeed, few have that care in this particular which they ought to have; for much more certainly depends on good and proper ſeed, than moſt perſons think.

Corn growing on virgin mould, or new broken up ground, is beſt of all; and where that cannot conveniently be had, it is adviſeable to get ſeed from ſome diſtant place at leaſt once in two years; or if from land in the ſame neighbourhood, let it it be from different ſort of land.

Mr. Yelverton of Ireland, had his ſeed from England; but whereſoever the ſeed is taken or brought from, take particular care that it be perfectly clean and ſweet. It is generally agreeed, that the largeſt and faireſt of the ſort ſhould be choſen for ſeed; as uſually producing the moſt, the largeſt, and the beſt ears of corn: which rule generally holds good.

Another article is making the ſeed clean from ſeeds of weeds, and filth of all ſorts, as well as from bad grains. In this caſe a little pains at firſt, will ſave a great deal of trouble afterwards, as to the keeping the ground clear, as well as from bad and ſmutty corn.

Of ſteeping ſeed wheat.

This relates not only to ſeed wheat, but to many other ſorts of grain and vegetables.

We have mentioned the compoſition uſed by Mr. Yelverton; and ſhall add that uſed by Colonel Plummer, another ſucceſsful raiſer of wheat. But as to the many compoſitions which have been much cried up, and ſold at a great price; they have ſeldom given ſatisfaction.

Col. Plummer *of* Hertfordſhire's *way of ſteeping wheat.*

Waſh the wheat through three or four waters, ſtirring it well each time, and ſkim off the light grains. Put water in a tub with a tap, with as much ſalt as will make an egg ſwim; then add as much more; ſtir it well, and put in two or three pounds of allom beat fine, and ſtir it again well. Uſe it as ordinary brines, only ſteep the wheat thirty or forty hours: for leſs ſignifies nothing. Take the wheat out the night before you ſow it, and ſift ſome ſlaked lime on it. And add freſh quantities of the ingredients as wanted.

A good way is to ſteep the ſeed in rain water, in which bay ſalt is mixed, till it will bear an egg, for thirty hours; and after to ſpread it on a floor, with fine lime mixed with it, and ſtirred together till each ſeed leaves clinging to another, and till it ſeems candy'd with lime.

There are other receipts given to the ſame purpoſe; and that which Mr. Ellis ſeems to value himſelf much upon, mentions the diſſolving three pounds of copperas in two or three gallons of ſcalding water; ſtir it till it is diſſolved; and, when juſt warm, pour it over two or three buſhels of wheat. A quarter of an hour after pour over all the wheat ſeed, as much dunghill water as will make the whole ſwim four inches; and ſtirring it ſufficiently, you may ſkim off all the ſeeds of weeds, and the light thorns that occaſion ſmut and pepper wheat.

The ſeed is to lie in this twelve hours; then draw all clear off, and lime it directly for ſowing the ſame morning: or if the ſeed lay and drained twelve hours firſt, it would be better.

Of ſowing wheat.

The time for ſowing wheat in general, is from the middle of September to the beginning of December; but ſome ſorts, and upon ſome particular occaſions, others may be ſowed at different ſeaſons.

In general great regard is to be had to the nature of the land, and the weather; dry land may be ſowed with care in moiſt weathers (though not in wet, if it can well be avoided) and ſtiff wet land is only to be ſowed in a favourable time, for fear of the ſeed being loſt: it is much the beſt to ſow the ſeed in freſh mould, and for that reaſon they commonly ſow as ſoon as ever the ground is made ready to receive it.

The ſowing the broad caſt way is very well known; but the ſowing of wheat by hand, ſowing or ſpraining the ſeed in along the ſtitches, as was before mentioned, and as they frequently ſprain in peaſe, is not ſo common; though this latter manner ſeems to come the neareſt ſetting in rows; or ſowing according to the drill huſbandry.

The next thing to be conſidered is,

How

How the wheat and the ground are to be ordered whilſt they are together.

The firſt care is to get all the croſs gutters and thoroughs well cleanſed, and the looſe mould and corn in them caſt upon the plowed ground; for which purpoſe a ſmall plough is uſed in ſeveral places, which is eaſily drawn by any horſe, and contrived to throw the looſe mould and corn on both ſides, and leave the thoroughs perfectly clear and ſmooth to let the water run off.

After this there ſeems three things neceſſary to be conſidered under this head:

Firſt, what is to be done when the wheat is too forward or rank, which would endanger its being laid and ſpoiled.

Second, what is to be done when it is too poor.

Laſtly, the keeping it clean from weeds. This laſt is a calamity the beſt huſbandmen often ſuffer by; ſince the ſeeds of weeds are frequently carried by winds and by birds; and often lie concealed years in the ſoil.

When wheat is too rank, it is ſometimes proper to mow, ſometimes to eat it, and ſometimes to fold ſheep on it. This laſt is not only an advantage this way, but alſo for the improving the ground, not only by the dung and urine of the ſheep, but by the fining of the mould by their treading it with their feet; and the nouriſhment conveyed by the warmth of their bodies.

As to refreſhing the ground when too poor, by additional improvements; the folding anſwers that end very well; and, in other caſes, the ſprinkling on a few buſhels of ſoot, malt duſt, pigeons dung; or any thing of that kind will anſwer the end deſired, or even fine mould or dung mellowed: eſpecially if the wheat be hoed as before mentioned, which alone would anſwer the end of refreſhing the wheat very much, as well as help to keep down the weeds.

Weeding the growing corn in the common way, by cutting up, or drawing where it can be done without prejudice, helps to make the ground ſweet and clean, gives the grain more room to grow, and to receive the benefit of the air, the warmth of the ſun, the fertilizing dews and rains. Further, it makes the reaping the corn cheaper, and ſaves a great deal of trouble in every article.

But this is only a temporary help, not reaching the root of the diſtemper, which lies deeper.

We have mentioned the benefit of hoeing of wheat; and this ſummer I ſaw the advantage of it, when performed with a ſmall hoe, and a ſkilful hand: this deſtroys moſt of the roots, ſo that all annuals were deſtroyed; and thoſe of a more laſting nature, prevented from doing any more miſchief that ſeaſon: the fruit of this hoeing was, I ſaw not one weed in a whole field of wheat this ſeaſon, at the reaping.

The reader muſt not expect the ſame ſucceſs on one hoeing, or weeding; ſince this farmer had for ſome years induſtriouſly extirpated all weeds, and carefully avoided every thing which he thought could occaſion their growth; ſuch as the carrying dung with weeds in it to the ground. Notwithſtanding which, he frequently obſerved a new growth of weeds when he plow'd deeper than uſual, or near the hedges.

Theſe remarks are conformable to the obſervations of the late Mr. Ray, who obſerves, that many ſeeds will grow when kept ſeveral years, and moſt when kept more than one; and that ſeveral ſorts had been kept fourteen years, and ſome buried ſo long in the ground, and yet grew when brought again into the open air and ſowed.

Theſe remarks will give the farmer an inſight into the origin of weeds, and put him on carrying his thoughts further, in order to obtain a remedy.

There are two ſorts of weeds, annuals and perennials.

Annual weeds will be eaſily managed, if care be taken to prevent their ſeeding.

As to the perennial, the ſame methods will in a great meaſure procure the ſame preſent advantage; but as they will grow again, and many of them will ſpread, there is no effectual remedy, but extirpating them by a common dock ſpade, uſed for drawing up docks, or deſtroying them by expoſing them to the heat of the ſun, or ſeverity of the cold, the former of which is the moſt effectual; or elſe by harrowing them off on plowing, and then burning them.

In ſome caſes other remedies may be applied: I have known ſalt brine in Cheſhire poured on walks to deſtroy weeds, and ſcalding water will take the ſame effect.

Where ſalt water is near it may be applied for this purpoſe, eſpecially for deſtroying weeds on dunghills or compoſts; but care muſt be taken not to apply too much, for fear of the over-ſalting it, and preventing the growth of the corn or graſs for ſome time; the farmer may ſafely pour an hogſhead of ſea water, on every ſuch quantity of manure as he deſigns for an acre of land, which will kill the weeds on the dung, and enrich the ground.

Where the corn is ſowed in drills at a proper diſtance, it will not be difficult to clean it from weeds by hoeing; but care muſt be taken, that the weeds are toſs'd, or laid ſo that they grow not again.

How the wheat is to be managed when ſeparated from the ground.

Here it will be proper to mention the different methods of managing corn whilſt in the field, uſed by the north and ſouth country farmers, with their reſpective reaſons for their conduct.

In the north counties, at the evening, they ſet up eight ſheaves, cloſe in two rows, and then cover them with two large ſheaves half opened, and then draw over the tops of the others, which ſhelter the whole like a thatched cover, and will protect all for ten or twelve days or longer: in caſe of exceſſive rains the wet ſides of the two covers will ſuffer, but very rarely any other part: and it muſt be a continued long ſeries of very ill weather, if the farmer has not an opportunity of houſing his corn well.

In the ſouth they ſet up twelve or twenty ſheaves in two rows, without any cover, which they ſay helps to whiten the wheat; but if any violent rain or wet happen, all their corn ſuffers.

Where corn is very dry and clean, I have ſeen it carried away as ſhorn; but the more uſual method in both parts of the kingdom, is to let it ſtand ſome time in the field to make it whiter, and to ripen any part which wants a little weather; and alſo to kill graſs or weeds which may be yet amongſt the corn, and which may be prejudicial to it when in the barn.

However different theſe ſentiments of the farmers may be, all good ones agree, that it is wrong to houſe the corn too ſoon; and better to err rather in the other extreme, it being almoſt a proverb, "It is better to ſpoil corn in the "field than in the barn."

The next thing is the mowing it cloſe in the barn, or ſetting it on a ſtack out of doors; in both which caſes it is difficult to guard againſt vermin, though ſome are very dextrous in what they call mowing the mouſe out of the barn: but the ſetting it on poſts, or ſtones capped with others, which reach over the firſt on every ſide, is generally found the beſt. Corn may thus ſtand ſeveral years ſweet and good. And in ſome parts of Staffordſhire, and ſome other places, they make their ſtacks round, a circle being the moſt capacious of all figures, and the moſt ſecure againſt ſtorms, breaking the force of them gradually; whereas the ſquare ones receive the full force of the wind and wet, and all the inconveniences attending them.

However careful the farmer may be, mice will ſometimes get into his ſtock, and are frequently carried in the ſheaves out of the field, and are ſoon of very ill conſequence. It may be known if they are there, by thruſting an aſh pole, or poles, pretty far into the ſtack, which the mice will eat the bark of; for mice will eat the bark of the branches of ſeveral trees, and the tenderer the bark the greater the temptation, and the eaſier it is done.

The immediate thatching, or otherwiſe ſecuring the ſtacks till thatched, is very expedient; and is often delayed in harveſt to the conſiderable prejudice of the farmer, which might be in a great meaſure prevented at a little expence, by moveable covers, as was formerly mentioned.

The price of thatching, where labourers have one and ſixpence per day for doing the whole, is uſually ten-pence for an hundred ſquare foot.

Threſhing is the next thing to be conſidered. This is generally performed the beſt and eaſieſt in warm dry weather, or in froſt; for notwithſtanding the barns are kept as cloſe as poſſible, the grain is found to quit the huſk the beſt in thoſe ſeaſons, which ſhews what influence the weather has, even where it would not be expected to occaſion any ſenſible alteration.

The common price for threſhing, cleaning, and putting wheat into the ſacks, is two ſhillings a quarter, where the labourer's wages are fourteen-pence per day at that ſeaſon, and it muſt be proportionably leſs where wages are leſs. But good or bad corn makes a difference as to the work, and will have its influence alſo on the wages; and ſo will the quantity of grain in the ears, ſome having above forty, ſome above thirty, and ſo on. Care muſt be taken the corn be not damaged, when threſhed by lying on a damp floor too long, before it is cleaned or carried off.

There is a great difference even in the article of cleaning corn between the ſouth and north country farmers; the former cleaning it by caſting in the barn, from one end of it to the other, the beſt flying fartheſt, and then ſeparating and cleaning it again after, by the wheat ridler, or fan; whereas the north country farmers perform this by wind, which generally does it very well; and in defect of that they have a fan with ſails, turning on an axis, which does the buſineſs effectually.

The next thing is to ſend the corn to the market, if the price be agreeable, or to keep it in hopes of a better: where any perſon is of ability, and has an opportunity of keeping corn when it is cheap, he has a fair proſpect of promoting his intereſt; corn generally bearing double the price if one crop miſcarries, which it generally does once in four or five years. The Dutch have frequently bought our corn, and ſold it again to us at double the price.

He who ſaves corn in plentiful years, may be called a publick benefactor, as really promoting the publick good. For it has often been lamented, by wiſe and good men, that we have no publick granaries, to ſupply us in a time of ſcarcity.

The countries moſt famous for abounding in corn heretofore, were Thrace, Sardinia, Sicily, Egypt, and Africa.

When Auguſtus had reduced Egypt, he took peculiar care of the bed of the Nile, which by degrees had been clogged with mud, through the neglect of the Kings of Egypt, and cauſed it to be cleaned by the Roman troops whom he left there. From thence came regularly every year, twenty millions of buſhels of wheat. Without this ſupply the capital of the world was ſometimes in danger of periſhing by famine.

When Severus died, there was corn in the publick magazines for ſeven years, expending daily, bread for ſix hundred thouſand men.

Conſtantinople was ſupplied in the ſame wiſe manner, when the empire was fixed there; and an admirable order was obſerved in both thoſe cities, for the ſubſiſtance of the immenſe number of inhabitants.

Conſtantine cauſed fourſcore thouſand buſhels of corn, which came from Alexandria, to be diſtributed daily at Conſtantinople: this was for the ſubſiſtence of ſix hundred and forty thouſand men; the Roman buſhel ſerving only eight perſons.

To give a later inſtance of the effect of magazines, after the fatal battle to the French at Blenheim, the French generals waited on the King, with an intent to get his directions how to recruit their forces, none of them venturing to name the great diſtreſs they were in. The King aſked if his publick magazines for his ſoldiers were full, and being anſwered in the affirmative, he ordered them to take care that they were kept ſo. And ſoon after they found the effects of that proviſion, for there being a ſcarcity in general, and good proviſions made for the ſoldiers, the army was ſupplied without compulſion.

Theſe inſtances will convince us of the wiſdom of keeping of corn; and alſo that it is poſſible to do it for many years, which is next to be conſidered.

There are various methods of preſerving corn, which may be conſidered either as they relate to publick granaries or magazines, or as they concern and are the property of private perſons. As there is at preſent no appointment of the former with us, I ſhall only juſt mention two or three particulars about them; and then come to what is within the compaſs of private perſons, and what may be of advantage to thoſe who are deſirous to promote their own and the publick good at the ſame time.

Varro aſſures us, corn would keep good fifty years, when ſhut up cloſe in the ear in ſubterranean caverns, which they covered on all ſides with ſtraw, to defend it againſt damps, cloſing the entrance with great care.

The method of preſerving corn in the ear is ſtill practiſed, when it is to be ſent to far diſtant places. And it is ſent after this manner to America, in caſks perfectly well ſtopt up, otherwiſe the ſubſtance will evaporate, and the plantation of it prove ineffectual.

Another method is to clean and dry it well, and remove it once in fifteen or ſixteen days, for half a year; then if it is laid up dry it will need little more care.

After two years good preſervation it may be kept forty, fifty, or a hundred years, by lodging it in pits which are covered with ſtrong planks well joined together; or, which is a more ſecure method, by covering the ſurface of the heap with a ſmall quantity of quick-lime, and then diſſolving it again by ſprinkling a little water upon it. This quick-lime will cauſe the grain to ſhoot two or three fingers in depth, and form a ſurface or incruſtation, which is too ſtrong to be penetrated either by the air, or inſects.

In ſome cities abroad they have receptacles for preſerving corn in the town walls, particularly at Leghorn, which being cloſe ſtopped, kill vermin, and keep the corn good.

As to preſerving ſmall quantities for four or five years, which, in general, is long enough for private perſons in this country, the keeping corn in a ſtack ſet upon wooden poſts of ſtones, with caps over them, has been found abundantly ſufficient to anſwer, the preſerving the corn good, and the bringing profit to the owner.

As to the farmer's wanting the ſtraw for his ground, and the chaff for his horſes, theſe are conſiderations too trifling to be ſet in compariſon with the advantages propoſed by the keeping of corn, eſpecially in corn countries, in which the ſtraw is little valued in plentiful years, and the chaff leſs.

It is common with farmers to keep corn in bags, and a great quantity may be ſecured in hair bags in a little compaſs, and placed ſo that cats may alſo keep the place clean, if kept in common ſacks.

About Hempſted they put five buſhels in a ſack, which is about three hundred weight, which ſtrong fellows are hired to carry up into the repoſitories.

Where full ſacks are uſed in rooms or granaries, I have obſerved a commodious little machine uſed for conveying them from place to place, by which I have ſeen twenty quarters of corn delivered out with great eaſe in a very few minutes.

Some place their wheat, when threſhed, in the chaff, in the midſt of a ſtack of corn in which it will lie in a comparative little compaſs.

The moſt effectual method is to have a granary raiſed on poſts, or ſtones capped, for corn ſtacks: this, if contriv'd as malt-houſes are, with ſeveral floors, the corn may be eaſily removed, when neceſſary, from one to another, readily downward; and, by proper pullies, with no great difficulty, to the higheſt; and, by ſuch removals, kept perfectly clean and ſweet as long as deſired.

The place where corn is kept ought to be free from damps and all moiſture, as well as from ill ſmells of all ſorts; all which ſoon give a tincture to the grain, and make it muſty, ill-ſcented, or ill-taſted.

Few who have made any obſervations, but know how ſoon good or ill ſmells are communicated from one body to another, when placed near together. Coffee gives a tincture to tea, when near it. The faculties of many of thoſe diminutive creatures which deſtroy corn, are much finer than ours, and therefore ſeveral herbs and compoſitions may keep them from touching it; ſome things being immediate death to them, which we ſcarce perceive. Dry wheat ought to be placed in a clean ſweet place for keeping, and it will not be right dry for the purpoſe till after March.

The ſubſtance of all the methods for preſerving of corn is much the ſame, to have what is good, ſweet and dry at firſt; and to keep it from air, wet, and vermin after.

As to vermin, the waſhing the walls and floors with bitter herbs and drugs, with leaves of wormwood, vinegar, and beaſts galls, is ſerviceable; and where they are uſed, weavils or worms will ſeldom bite; the aſhes of green oak are ſaid to kill mites when ſpread on the floor.

We before mentioned the power of lime ſlacked in this reſpect; and brimſtone ſeems to have an effect beyond every thing of this kind. When a little of it is taken inwardly, it will communicate a ſmell through the body to the cloaths; and, if applied outwardly, will colour money in the pocket.

A calculation of what ſeed wheat is required when ſowed at different diſtances; and of what produce may be reaſonably expected from each reſpective method.

An acre of ground contains four thouſand eight hundred and odd ſquare yards; and in the following calculations, I ſhall compute it by even numbers; that is, by five thouſand yards to be ſowed; and making allowances for thoroughs, headlands, and other accidents, ſhall reckon four thouſand yards to produce corn: we ſpeak here only of the common old methods of huſbandry.

An ounce of wheat may be computed to contain ſix hundred grains; and there being ſixteen ounces in a pound, there will be nine thouſand ſix hundred grains in a pound: there being about ſixteen pounds in a peck of wheat, there will be one hundred fifty-three thouſand ſix hundred grains in the peck: reckoning a buſhel of wheat at ſixty-four pounds.

An acre of wheat ſet at twelve inches diſtance, allowing ſeed for five thouſand yards, will take forty five thouſand grains, that is not quite five pounds or the twelfth part of a buſhel.

When the grain is ſet at eight inches diſtance, it requires double the number of ſeed: that is, eighteen to a yard, being ninety thouſand grains, not near a peck of wheat.

When the corn is ſet at ſix inches diſtance, there will be thirty-ſix grains in a yard, and one hundred and eighty thouſand grains in an acre.

And when it is ſet at four inches diſtance, there will be eighty-one in a yard; and in the whole acre, four hundred and five thouſand, not three pecks of wheat. Reckoning one hundred fifty-three thouſand grains to a peck of wheat; and ten pecks of wheat, which is the common allowance of ſeed to an acre, as we uſually ſow the ground, there will be one million five hundred thirty-ſix thouſand grains of corn to an acre; and ſo there will be near four grains ſowed on every ſquare of four inches; that is, almoſt a grain to every two inches ſquare, or four cubic inches.

The product of wheat when good, is about five quarters, which is ſixteen times the ſeed that is generally ſowed, which is a better produce than they had formerly in many places. We are informed by Cicero and Pliny, that ten for one was the higheſt produce of an acre, but the ordinary produce was eight, with which the huſbandman was well content.

The ears of wheat uſually contain from thirty to five and forty grains each; and taking forty as the middle produce, and allowing twelve ſtems to each grain of the corn ſet at a foot diſtance, which is as much as they will bear without the benefit of horſehoeing: and reckoning four thouſand yards to produce corn, then each ſtem producing four hundred and eighty grains, there will be in the whole thirty ſix thouſand times four hundred and eighty; which in the whole will be ſeventeen millions two hundred and eighty thouſand. And there being ſix hundred fourteen thouſand four hundred grains in a buſhel, there will not be quite forty buſhels in an acre ſo ſet at a foot diſtance, with the ſuppoſed produce of twelve ſtems to each grain, and forty grains to each ear.

When the grain is ſet at eight inches diſtance, there will be double the quantity ſowed; that is, eighteen grains in each yard, and eight ſtems to every grain of ſeed, the number of ſeeds will be ſeventy-two thouſand; which, being multiplied by three hundred and twenty grains ariſing from eight ſtems, the produce will be twenty-two millions and forty thouſand, which is about a fourth part more than what was ſuppoſed to be produced from the ſeed ſown at a foot diſtance, this being ſomewhat above ſix quarters to an acre.

When the grain is ſowed at ſix inches diſtance, with an allowance of ſix ſtems to grow from each grain, there will be one hundred and eighty thouſand grains of ſeed; that is, thirty-ſix times five thouſand.

As there will be four thouſand yards that will bring corn, and each yard has thirty-ſix grains of ſeed ſowed on it, and each ſtem forty grains, that is, two hundred and forty times thirty-ſix, multiplied by four thouſand, makes thirty-four millions five hundred and ſixty grains of corn, which is a third more than aroſe from ſowing at eight inches diſtance; and, conſequently, above nine quarters to an acre.

When the grain is ſet at four inches diſtance, and four ſtems are allowed to ariſe from each grain for four thouſand yards, there will be eighty-one times four thouſand ſeeds to be reckoned to produce corn; and then there will be in the whole three hundred and twenty-four thouſand ſeeds, which being multiplied by one hundred and ſixty times, each ariſing from one corn with four ſtems, and each ſtem ſuppoſed to bear forty corns, the whole will make fifty-five millons eighty-four thouſand, which will be near a third part more than thoſe ſet at ſix inches diſtance are ſuppoſed to produce; and three times as much as thoſe produce which were ſet at a foot diſtance, and would be near twelve quarters, which have been frequently obtained in the common way of ſowing.

If we ſhould enter into the conſideration of grain when ſowed cloſer than four inches, we ſhall come into that uncertainty of the diſtance which falls to the ſhare of each grain in the uſual methods of ſowing.

All theſe calculations ſuppoſe the common method of huſbandry to be uſed; we have ſhewn before the quantity procured by corn ſet at a diſtance and horſehoed.

The reader will not think that theſe calculations are to be depended upon as exact; they are only made to give him a general view of what may reaſonably be expected from ſetting corn at ſeveral diſtances; and will be found as near the truth as can be expected in an affair of this nature; in which the writings and practice of others have been of little ſervice to direct me; but which I have endeavoured to collect from ſome rules in huſbandry pretty well eſtabliſhed, and from ſome rules of proportion.

If theſe calculations be tolerably well founded, then the ſowing wheat in ſtitches by hand, as before mentioned, at four, five, or ſix inches diſtance in the rows, and in the ſame proportion in other caſes, may perhaps, conſidering the unavoidable loſs of many ſeeds, and vacancies of many places in all fields, be as good a rule to go by, as any can be given in general, for thoſe who will not uſe the horſehoeing method: for, whatever may be ſaid of the great extent of ſome roots of wheat in depth and breadth, four or five inches either way will be a good allowance when the ground is not till'd between.

One advantage may ariſe from tranſplanting wheat, which may not improperly be added to what was before ſaid on that head; which is, that by this means the farmer may have an opportunity of giving his land to which the corn is to be brought, the advantage of more plowing; and alſo the benefit of the winter froſts and ſnows, which are exceedingly advantageous. What the ingenious Dr. Beal ſays on this ſubject, cannot but make a deep impreſſion.

"I often aſk gardeners and huſbandmen whether all "ſorts of land are more fertilized, or more ſpeedily by the "ſolar influence in our climate, or by froſt; and they ge"nerally anſwer, that froſt and ſnow make the quickeſt "diſpatch amongſt us, and the more general and richer for "fertility*. Such a tranſplanting of wheat, may, in all probability, be often a great advantage to the wheat itſelf; for whenever that is too rank, it muſt be eaten or mowed down, or will be ſpoiled. But the removal of it will give a proper check to its growth, without any prejudice to the wheat.

From the brining or ſteeping of wheat, or other ſeeds, the following advantages are propoſed.

Firſt, that it will make the ſeed grow, and come up pretty much together; and conſequently, be ripe together.

Theſe often happen otherwiſe when the ſeed is not ſteeped, as part of it may fall where it may ſprout ſoon, and part lie long in the ground before it does ſprout. In caſe a long dry ſeaſon follows ſuch ſowing, ſome ſeeds, as barley, and others, may not come up at all, or in ſuch a manner as quite to ſpoil the crop.

The ſecond advantage, is the ſecuring it againſt birds, and vermin, and from its being ſpoiled by ſmut. And,

Laſtly, 'tis ſaid the ſeed ſteeped in proper ingredients imbibe a fertilizing richneſs from the prepared liquor; or from the lime uſually caſt on, and adhering, at the time of the ſowing it.

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* Philoſ. Tranſact. vol. II. p. 731.

That ſalt and lime, which are the ingredients moſt uſed on this occaſion, when properly applied, are great fertilizers of land, is too plain to need proof: and that they are deſtructive of vermin, is alſo found by the conſtant experience.

All houſewifes know how effectually ſalt preſerves proviſion from the taint by vermin; and the very ſmoke of a lime-kiln effectually clears all who engage in it, from the vermin they were before afflicted with; I have ſeen caterpillers drop from gooſeberry trees, under which a little lime was ſlaked for a trial.

The queſtion is whether ſuch imbibing of the brine, or other liquor, or the lime ſo adhering to the ſeed, ſhall be really a ſufficient future ſecurity of it againſt vermin and ſmut, and be a fertilizer of it in its growth.

We have undoubted proofs of the long continued effects both in ſmells and taſtes ariſing from a very ſhort application of one body to another; which we may reaſonably preſume to be the caſe of brines, ſoots, copperas, and particularly of brimſtone, and other ingredients of the ſame nature: and the general uſe of one or other of theſe by moſt farmers, ſeems to confirm the advantages reaped by them.

Good and bad crops are undoubtedly got both with ſteeping and without, the advice ſome give to keep the ground clean and ſweet, and to till it well, is certainly very good, and ought to be purſued by every ſenſible farmer, whether he ſteeps his ſeed or omits it.

Many are ſtrenuous againſt ſowing the uſual quantity of ſeed, and favour the drill huſbandry; but if little ſeed be ſown, and nothing done to ſecure that little againſt voracious birds, and deſtructive vermin, I doubt they would ſoon make ſuch devaſtation, as would leave many vacancies free from any corn at all.

There is an objection againſt ſteeping, which is, that when corn is brined and ſowed in a dry ſeaſon, the brined ſeed frequently grows mouldy and decays when not covered. But the ſteeping, if done right, will ſet it on ſprouting, and it will then ſtruggle hard to live: and it certainly is in as great danger of being devoured when not ſteeped, by lying open, as of growing mouldy from being brined. But the uſual quantity of corn ſowed will abundantly ſupply ſuch little accidents: and this very objection ſeems to ſhew, that the ſteeping preſerves it from vermin, when it is ſuffered to lie uncovered without being carried off by birds, or devoured by inſects.

A regular ſteeping will certainly produce the ſprouting of the ſeed, which is the firſt advantage propoſed by it.

This advantage cannot be hoped, unleſs it be ſteeped in a proper manner; for throwing a little urine or ſalt water over the ſeed is ſo far from obtaining this end, that it will rather produce the direct contrary, by occaſioning thoſe grains which happen to be brined, to vegetate ſooner than the others which are not.

It muſt be a regular brining of the whole that can produce a regular vegetation of all; and it is undoubtedly on this account, that in all ſenſible receipts for brining, an induſtrious and repeated ſtirring of the ſeeds in the ſteeping liquor, is earneſtly preſſed.

The waſhing the ſeed in fair water, directed in ſome of the receipts, ſeems to me prejudicial to the end propoſed by ſteeping it. The ſeed can imbibe but a certain quantity of liquid, and if it ſuck firſt fair water, it cannot after retain ſo great a quantity of the ſteeping liquor as it would otherwiſe do; and probably this might make it neceſſary for Colonel Plummer and others to make their brines ſo ſtrong, when as good an effect would have been found by a weaker, applied in the firſt inſtance.

And as to the clearing of ſeeds from light corn, as ſalt water is ſpecifically heavier than freſh, that refuſe would riſe better on the brine than in fair water.

In regard to the danger of ſeeds burſting, if ſowed in a wet time, or if a wet ſeaſon ſoon follow, that danger may be eaſily and ſafely guarded againſt, by enuring them gradually to gentle degrees of moiſture, according to their nature; and then committing them to the open earth, which I have tried ſucceſsfully in ſeveral inſtances. If we once knew what degree of moiſture any grain or ſeed will bear at firſt, without receiving of prejudice, it can be no great difficulty to uſe them in the manner they are able to bear at firſt; and then commit them to the open air, which they muſt be ſometimes hazarded in, whatever method is taken in the management of them.

It ſeems plain from experience, that many ſeeds may be made certainly to grow, and that equally as to their time of ſprouting, by ſteeping, which was the firſt advantage propoſed; the next thing to be conſidered is, the ſecuring it againſt birds or vermin, or from its being ſpoiled by what is called ſmut.

The ſteeping of ſeed was known in Virgil's time, and that with proper ingredients, to ſecure it againſt deſtructive vermin long ſince. For Sir Hugh Plat in his garden of Eden, (Page 61, 62.) mentions lime beaten to powder, and mixed with corn before it be ſowed, to prevent rooks and other fowls from devouring it, and puts a queſtion, if it does not alſo help to enrich. In another place he mentions, the laying peaſe in water a day or two before they are ſown, and puts a queſtion of ſteeping in milk, ſpirit of wine, or water that hath been long infuſed on dung, waſte ſoap aſhes, or common aſhes, whoſe ſalt hath not been drawn out before.

All this has, by repeated experience, been found to be right: and moſt farmers now uſe one ſort of brine or ſteeping compoſition or other for ſeveral ſorts of grain: we may preſume, that ſo general a practice, and the advantages procured by it when properly managed, will ſufficiently juſtify the proceeding in the ſame courſe of huſbandry; for I do not find it objected, that vermin ſtill devour the corn.

As the methods of ſteepings and brinings are numerous, and various, it is next to an impoſſibility to chuſe out ſuch as will fit all the different ſorts of grains and ſoils, but they all do, or ſhould point at the ſame end. That is, to convey ſomething to the ſeed diſagreeable to vermin; and which at the ſame time may fertilize or enrich them. We will conſider the former as it falls under this preſent ſecond head. And the latter, when we come to the third. To do juſtice to ſteeping, we ſhall conſider,

Firſt, the reaſonableneſs of the procedure; or the grounds we have to believe that it will ſecure the grain when ſowed.

Then thoſe conſequences which repeated experience hath taught us generally to ariſe from ſuch ſteepings.

Moſt creatures have a ſenſe of what is agreeable or diſagreeable to them, and avoid the latter; this is plain, when ſoot is laid round vegetables; which, whilſt freſh, keeps off vermin.

It is evident, ſeveral compoſitions are fatal to one or more ſpecies of creatures, which effect not others at all.

Lime, ſalt, ſmoak, and brimſtone, are death to many inſects.

Oil of turpentine, or ſmoak of tobacco, will kill moths; and, at the ſame time very little affect us, or many other creatures. Rubbing of hangings and furniture with ſheep's wool before it has loſt its fatneſs, will ſtop the progreſs of moths, but it does not occaſion any manner of uneaſineſs to thoſe who lodge in them.

As ſheep's wool has this effect in this caſe, may it not be reaſonably concluded, that it will operate much ſtronger againſt vermin when the ſheep lies on them in the fold. Folding of ſheep deſtroys ſlugs and worms, and there is the ſame reaſon to expect the effect in one caſe as in the other.

The faculties of theſe diminutive creatures are much finer than ours, both as to their ſmelling, and their being affected by ſcents. But the curious ſmell which dogs have, would appear ſurprizing were it not ſo commonly known.

Fumes of brimſtone will make leaves wither. And to animals are moſt deadly.

Dr. Hale ſays, he is told that it is by ſuch methods, that all the rats in ſhips are deſtroyed when in the harbour. And he farther obſerves, that the fumes of burning brimſtone, placed under corn, will aſcend through it with great velocity and acrimony.

Indeed, the effects of brimſtone are ſcarce credible by thoſe who are unacquainted with it; and we have reaſon to think greater effects will be diſcovered from it hereafter.

I ſhall add on this head, the ſurprizing effects of the liquor uſed by the bug-killers. A houſe was long peſter'd with bugs, and the bug-killers took down all the beds and furniture, and waſhed them, and the walls of the rooms with his liquor, and then re-placed them: it is now above three years ſince, and from that time there has not been a bug ſeen in the houſe. Nor was the operation attended with any ill ſmell, or other ſenſible inconvenience to any of the inhabitants, the dogs or cats. Nor did the ingredients ſtain any thing, or prejudice the frames of pictures.

Why may not ſomething of the ſame nature be contrived to be proper, ſafe, and effectual ſecurities for the grains and ſeeds, in fields and gardens, till they are armed againſt theſe great little enemies.

Several farmers put arſenic into their brine for wheat, and apprehend it beneficial; but this is a deteſtable practice.

This may, in a great meaſure, convince us what conſequences may ariſe from proper ſteeping the grain.

All the things commonly uſed alone, or in compoſitions for ſteeping ſeeds; ſuch as ſalt, lime, ſoot, copperas, nitre, flour of brimſtone, dunghill water, bay ſalt, and urine, are generally ſuppoſed to have a power to deſtroy animals pernicious to ſeeds, or at leaſt to preſerve the ſeed from being devoured by them; or elſe to be endued with ſuch a fertiliſing quality, as to forward the ſprouting and growth; and moſt of them certainly have one or other, or all the laſt-named qualities.

Seed alſo ſteeped in proper ingredients imbibes alſo a fertiliſing richneſs from the prepared liquor, or from the lime uſually caſt on it, and adhering to it at the time of ſowing it.

The truth of this will, in a great meaſure, appear from the general courſe of huſbandry, in applying manures in order to promote the vegetation of ſeeds and plants; by which ſome particular advantages are propoſed to be obtained by the conſent of all farmers. And therefore it may be taken for an indiſputable truth, being founded on reaſon, and confirmed by conſtant experience, that the growth of ſeeds is to be forwarded by the application of proper manures.

Particular manures ſuit particular feeds; pigeon's dung is richer than cow dung; and a load of any creatures dung feeding on animals will encreaſe vegetables much more than a load of dung of cattle fed on ſtraw.

It remains to ſhew, that the ſteeping ſo ſhort a time as is uſually practiſed, may convey a laſting benefit to the growth of the ſeed ſo ſteeped.

In the work of fructification I think (ſays Sir H. Plat) corn itſelf may be ſo philoſophically prepared, only by imbibition in the philoſopher's aquavitæ, that any barren ground, ſo as it be in nature kindly for corn, ſhall bring forth a rich crop, without any matter added to the ground*. Digby mentions a plant of barley riſing from one corn, that by ſteeping and watering with ſalt petre diſſolved in water, brought forth two hundred and forty-nine ſtalks, and above eighteen thouſand grains. Another gentleman had from three ſpires of ſteeped barley ſixty, ſixty-five, and ſixty-ſeven ſtalks apiece from their ſingle grain and root, with every one an ear on, and about forty or ſomewhat more corns apiece in them †.

Other inſtances of later date might be added; but they are not neceſſary.

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* Garden of Eden, p. 173.

† Philoſ. Tranſact. Vol. IV. 2d part, p. 310, &c.

This ſudden growth of a plant muſt either be owing to the ſimple unfolding of the infant ſeed, or to the operation of the compoſition uſed for the increaſe of it; therefore proper compoſitions applied to vegetables but for a ſmall time, may, and do oft convey a very fertiliſing power toward the growth.

A ſhort ſteeping may convey ſuch a laſting fructifying or fertiliſing quality, as will be of a continued ſervice to the growth of the plant.

We find ſeveral things much more incomprehenſible of laſting impreſſions made in a very ſhort time.

The touch of a loadſtone conveys a laſting impreſſion to the needle.

A little bud from a ſtriped holly, put into a large green holly, will gradually occaſion the whole green one to become ſtriped.

Other inſtances might be offered, particularly of the wonderful effect of poiſons.

We farther find it appear from experiments, and it has been evidently proved by Dr. Keil, that the growth of a tree very little leſſens the weight of the earth in which it ſtands. Mr. Boyle had ground dug up, and plants only watered with ſpring water; one weighed three pound, and one fourteen, and the earth was ſcarce diminiſhed: Helmont dried two hundred pound of earth, and planted a willow in it of five pound weight, which he watered with rain, or diſtilled water, and covered with a tin cover; and in five years the tree, and all the leaves it had borne, weighed one hundred ſixty-nine pounds three ounces, and the earth was diminiſhed but about two ounces.

May we not from theſe, and other experiments. reaſonably ſuppoſe, that ſteeping compoſitions may help to expand the unfolding plant, and make it more readily receive additions to its ſubſtance from the air and dews.

However this operation is performed, there cannot be any doubt of the truth, ſince there are ſingle things and compoſitions which forward the growth of grain and plants, by being applied to them, or by the grain or ſeed being ſteeped in them as is ſeen on tryal.

The only thing now remaining to be conſidered, is whether the brines or compoſitions commonly uſed, be proper to obtain the end, or which of them are likely to be of the greateſt ſervice.

We ſhould enter into a large field, were we to mention the innumerable receipts which are to be met with, and enlarge on their benefits and diſadvantages; but we ſhall only add, to thoſe before mention'd, two or three of the moſt noted relating to ſeed wheat, and then conſider which of the many ingredients may be the moſt likely to obtain the end.

The copperas receipt.

Put a tap and tap whips into a tub, and then put in two or three buſhels of wheat.

Take three pounds of copperas, put it into two or three gallons of ſcalding water, which will preſently diſſolve it.

Let it cool a little, and then put it all over the wheat; a quarter of an hour after, pour over all as much black dunghill water as will make the whole ſwim four or five inches; then ſkim off all the light bad corns.

In this liquor let the ſeed lie twelve hours. Then draw all clear off, and drain it twelve hours before liming.

The ſteeping uſed by Middleſex farmers.

At night put a quantity of water in a tub, with a tap, then put in five buſhels of ſeed wheat for two acres of ground; ſtir it well and ſkim off the ſeeds of weeds, and of all light corn; then draw off the water and take out the corn.

Put more water into the tub, and a pint of ſalt, and a pottle of ſtone lime, which with good ſtirring will ſoon break: then put the wheat in again, and ſtir the wheat, and the lime, in the liquor very well together, and let them lie ſo till morning.

Then draw off the watery part, and lay the wheat on an heap on the flour to drain dry, which it will ſoon do, ready to be ſowed.

If the kernels have not lime enough about them, ſift on more; but they have, this way, generally enough lodged on them.

Another receipt.

Throw bay ſalt into rain water till it will bear an egg; in this liquor ſteep the ſeed thirty hours.

When you take it out ſpread it on a ſmooth flour, ſcattering upon it good ſtore of the fine ground powder of ſlaked lime; ſweep this up and down, and mingle it with the corn, till every grain leave clinging to another, and become as it were candy'd with lime; then ſow it.

Malt fumed very ſtrongly, and being then ground and brewed, gives no ill taſte to beer.

Sea biſcuit, peaſe, and wheat, fumed in a large veſſel, and repeated again after ten days, will get little ill taſte. Expoſing them for ſome time to the open air, will free them from the very little taſte it gives.

But it is not adviſeable to fume corn thus which is intended to be ſown.

In the philoſophical tranſactions the following experiments are mentioned.

On the twenty-ſecond of March, 1699, a gentleman laid to ſteep a barley corn and a wheat corn in brimſtone water; a pea, a wheat, a barley, and an oat corn in allum water; and the ſame in a diſſolution of ſalt of tartar; in the caput mortuum of ſal armoniac, diſſolved in urine; in a diſſolution of the ſalt of walls; in a diſſolution of ſalt petre; in a diſſolution of noſtoc, or ſtar gelly.

He ſteep'd them five days and five nights, and ſet them in a garden in a good ſoil, againſt a north wall, full in the ſun, on the twenty-ſeventh of the ſame month, after a rainy night, with a pea, a wheat, a barley, and an oat corn unſteeped.

On the tenth of April following, he found that ſome were juſt come up, ſome not.

The pea, the barley, and the wheat ſteeped in brimſtone came up all together.

The pea ſteeped in allum water was very big and ſwelled, but had not ſo much as ſprouted; but the barley, wheat, and oat above ground.

The pea ſteeped in the ſolution of ſalt of tartar was half come up, the wheat ſcarce ſprouted, but the barley and oat quite up.

The pea, the wheat, the barley, and the oat ſteeped in the caput mortuum of ſal armoniac, diſſolved in urine, were all up together; as were alſo the next row, that were ſteeped in the ſolution of ſalt of walls.

The pea and wheat ſteeped in the diſſolution of ſalt petre were about half up, but the barley and oat quite up.

Thoſe which were ſteeped in noſtoc, were none of them come up, or ſcarce ſprouted.

The barley and oat ſteeped in urine were come up, but the pea and wheat ſcarce ſprouted. And to his ſurprize the pea, wheat, barley, and oat that were not at all ſteeped, were all of them as ſoon up as any of the former except the wheat, which was about half up.

They were all ſet about a finger deep in the ground, and there was all the time of their growth very fine weather.

From this he ſuppoſes allum water is againſt the nature of peaſe, and retards their growth, but agrees well enough with wheat, barley, and oats.

That the ſolution of the ſalt of tartar is not friendly to the nature either of peaſe or wheat, but agreeable to oats and barley.

That the water of ſalt petre had not any of the great power or virtue that he expected.

And that theſe ſteepings did not further any of the ſaid grains in their growth and coming, but plainly retarded ſome or moſt of them.

In all theſe laſt experiments the ſeeds were ſteeped five days and nights, which is much longer than any other ſteepings practiſed that I know of.

I rather wonder any of them came up at all, than that ſome of them miſcarried; for ſeveral ſeeds will do well when ſteeped a few hours, or a day or two, according to their nature, and the ſtrength of the liquid, which yet would be ſpoiled by being ſteeped longer.

We may reaſonably conclude, that thoſe which came up when ſteeped ſo long, would have ſucceeded better had they been laid leſs time in the liquids: and therefore we may reaſonably hope for ſucceſs, by prudently trying ſome of theſe mixtures again, or varying them.

The urine, as mentioned, ſeems tolerably ſucceſsful, but in ſeveral tryals I have made, it has deſtroyed the vegetative power of wheat, and ſeveral other ſeeds, in leſs than five days. There may be a difference as to the ſtrength of urine according to different diet.

Much the ſame may be ſaid about the fuming with brimſtone, before mentioned, to be twice repeated, and then attended with ill ſucceſs, as to the vegetation of the wheat; Which probably might have grown, if it had been ſowed after once fuming. I am the more induced to believe this, becauſe we find, in the laſt mentioned experiments, that all the grains which were ſteeped five days in brimſtone water came up together.

As brimſtone ſeems, from its piercing qualities, ſtrong and laſting ſmell, and frequent violent effects, to promiſe fair for being uſeful in this particular, as it is found to preſerve bread and corn; the curious would do well, to make proper trials of it in different ways and manners. This may be done at a trifling expence: but the nature of brimſtone requires they ſhould be careful.

In ſeveral trials I made, I kept the ſeeds twelve, four and twenty, and thirty-ſix hours in the ſame liquid, and ſowed them ſeverally at the times taken out of it; and I have found generally, that wheat, turnips, coleſeed, and many others, will grow freely after being ſo ſteeped in ſea water, freſh water, or in freſh water ſalted equally to the degree ſalt water is; which is made ſo by diſſolving an ounce of common ſalt in a quart of common water.

In the laſt mentioned experiments, the unſteeped grains came up near as ſoon as thoſe which were ſteeped; but that is nothing extraordinary, conſidering that he ſowed them after a rainy night. For I have ſeveral times obſerved, that the ſteeping a day or two before ſowing, in moiſt weather, is no great advantage as to the forwarding the ſprouting of the grain. The reaſon is the fair water being finer, the ſeed imbibes it quicker than that made thick by the mixture of ſuch ingredients as are commonly uſed on theſe occaſions.

Perhaps the long ſteeping the ſeeds which is uſed, might occaſion the ſtopping of the paſſages of the grain in its ſprouting. It is hard to ſay, with any tolerable certainty, which ſteepings and brinings are the beſt, for the ſeveral grains and ſeeds they are commonly applied to: to aſcertain them in a very exact manner, the nature of the ſoil, the ſeaſon of the year, the ſpecies and kind of grains and ſeeds, the ſeveral ſorts and different quantities of the ingredients to be uſed, and the length of time they are to be applied, ought to be carefully conſidered.

In the common ſteeping of wheat in ſea water, or in water in which ſalt is diſſolved, and the time the ſeed is to lie in it, there is nothing certain yet agreed on. Some think the fatneſs of ſea water ſufficient, others would have their brine ſtrong enough to make an egg ſwim, and others adviſe to put as much more ſalt again as would make an egg ſwim.

There is as great uncertainty as to to the time of the ſeed lying in the brine, various directions being given about it, ſome naming four hours for the beſt time, ſome forty, and others different times between thoſe two: not to mention that great variety of ingredients commonly mix'd with brine, and how they operate jointly or ſeparately, uſed ſeverally by various perſons; to omit the different management of the ſeed after it is taken out of the liquid.

They are much miſtaken, who imagine the liming to be only to make the ſeed ſow better: I apprehend both the lime and the ſalt adhere to the ſeed, and not only guard it by their taſte and ſharpneſs, as long as their virtues remain, but alſo communicate ſome of theſe their properties to the growing plant, and occaſion a ferment in the earth.

Upon the whole, lime and ſalt may be ſafely and plentifully uſed in ſteeping and brining of wheat.

By careful experiments, this manner of brining may be brought to a reaſonable certainty, as to the general practice. And perhaps the wheat itſelf may be found, when rightly ordered, to imbibe ſuch quantities only of each ingredient, as will beſt anſwer the ends deſired; and at the ſame time to refuſe ſuch overplus, or ſuch kinds of juices as may be prejudicial to it.

It will be proper to avoid uſing ingredients alone, which are too ſtrong for wheat, ſuch as urine, when not diluted: and not to keep the ſeed ſo long in any compoſition, as may rob it of its vegetative quality.

Lime and ſalt are undoubtedly excellent ingredients, and ſo are ſeveral other things directed in ſome of the receipts for brining above-mentioned; and if brimſtone can be brought to be uſeful in theſe affairs, either alone or with other ingredients, both the ſmell, the piercing quality, and great power in the deſtroying of vermin, ſeems to promiſe fair for its being very ſerviceable for the preſerving of the ſeeds.

Of Barley.

Barley is eſteemed the next uſeful grain to wheat, and ought to engage our ſecond care.

On the ſucceſs of the wheat and barley in the corn countries, farmers generally depend for the payment of the principal part of their rents, and for the happineſs of themſelves and families; the other grains being expected rather to provide conveniencies for themſelves, and to maintain their ſtock, than to raiſe any great ſums.

Barley hath a thick ſpike; the cup, huſk, and flower, are like thoſe of wheat or rye; but the awns are rough, and the ſeed ſwells in the middle, and for the moſt part ends in a ſharp point, to which the huſks are cloſely united.

The great uſe of barley is to make beer.

In ſome counties they make bread of it, but it is coarſe and unpleaſant.

It is alſo uſeful to be given to the ſeveral ſorts of cattle, and for the feeding of fowl.

It is far more beneficial moſt ways, when made into malt; for it is then ſo ſweet, and endued with ſo fattening a quality, that few things exceed it. And the uſe of maſhes made of it for horſes, and other cattle, are very well known. This ſhews the fine ſpirit which is originally in the grain, ſince neither the ſteeping, or the drying it for malt, can take ſuch a quality to it.

The uſe made of it by the diſtillers, ſhews the ſpirit that is in it. There is ſome difference amongſt writers, as to the names and ſorts of our barley; Ray mentions three kinds.

1. Hordeum diſtichum; common barley.

2. Hordeum diſtichum minus; ſprat barley, or battledoor barley.

3. Hordeum polyſtichon; winter, or ſquare barley or bear barley, called in the north, where it is commonly ſowed, barley big.

Mr. Lawrence mentions four remarkable ſorts of barley.

Firſt, the long-ear'd, moſt generally eſteemed for all uſes.

Second, the ſprat, or Fulham barley, which is beſt for rank land.

Third, the hotſpur, or Rathripe barley, commonly got in, in nine or ten weeks. This is uſeful on many accounts, for that reaſon, as it may be ſowed later, and will ripen in thoſe places where the others ſcarce will grow: it gives the farmer the command of ſome weeks, either before the ſowing it, or after the reaping, which is often of a very great advantage in the courſe of huſbandry. He may eat his turnips longer, or ſow later with this barley than otherwiſe. There are alſo inſtances where two crops of this barley have been got in one year, from the ſame land.

Fourth, Scotch barley, which gives the drink made of it a taſte diſagreeable to ſtrangers; and a purging quality.

Miller mentions five.

Firſt, the common long ear'd barley:

Second, winter, or ſquare barley, or bear barley, by ſome called big.

Third, ſprat barley, or battle-door barley, as Mr. Ray.

Theſe, he ſays, are commonly cultivated near London; but unthinkingly, in the next page, adds, that the ſquare barley, or big, is chiefly cultivated in the north of England, and in Scotland; but ſeldom ſown in the ſouth of England, though it might be cultivated to good purpoſe, on ſome ſtrong, cold, clayey land: which is true.

The other two ſorts cultivated in England, are, the Rathripe barley, before mentioned. And,

The naked barley, which makes tolerable good bread, and very good malt, and yields great increaſe.

All theſe ſorts of barley are to be ſowed in a dry ſeaſon, but at different times, according to the nature of the ſoils, and the ſorts of barley. It may, in general, be ſowed from the beginning of February, but rather in March and April; and the Rathripe will bear ſowing in the beginning of May.

Barley has the ſhalloweſt roots of all the white corn, and yet ſtands firm.

It will not grow in many ſoils where wheat will. A ſtiff earth is not proper for it, unleſs it be brought into an exceeding fine tilth.

From the ingenious Dr. Hale's calculation of the violent heat and evaporations in the ſummer months, and the ſmall quantity of dews which then fall, and the little further ſupplies which are given to trees, corn, and vegetables, frequently for a long time together by rains, vegetables would be dried quite away were they not ſupplied with moiſture from ſome other origin: this he reckons to come from the moiſture in the earth two or three foot deep under the trees.

Since theſe experiments have gained ſuch a character, I doubt not but the ſubſtance of thoſe which relate to this particular, will be agreeable to the reader; eſpecially as I ſhall only give the reſult of his ſeveral calculations, as I have abridged them. "If theſe experiments and obſer-"vations, ſays that author, give us any further inſight into "the nature of plants, they will then doubtleſs be of ſome "uſe in agriculture and gardening, either by ſerving to "rectify ſome miſtaken notions, or by helping further to "explain the reaſons of many kinds of culture, which "long repeated experience has found to be good; and, "perhaps, by leading us to make ſome advances therein, (P. 360.)

"For, the farther reſearches we make into this admirable "ſcene of things, the more beauty and harmony we ſee in "them: and the ſtronger and clearer convictions they give "us of the being, power, and wiſdom of the divine ar-"chitect." (Introd.)

The growth of vegetables is promoted by the motion of their fluids; and in them alſo, by the ſame method of inquiry, conſiderable diſcoveries may be made, there being in many reſpects, a great analogy between plants and animals.

This author has examined their ſeveral perſpirations, and found that a man perſpires in twenty-four hours, about thirty-one ounces; and an equal plant, allowing for evening and morning, twenty-two ounces: ſo a man is to a flower, as one hundred and forty-one to one hundred, in this particular.

He further found that in one and twenty days in ſummer, there were near ſix and twenty ounces more wet evaporated from a circular area of a foot in diameter, than fell in dews: and therefore juſtly concludes, "That plants would "then periſh, if they had not ſome other freſh ſupplies, "either from rains, or from below; finding the evaporation to be four times as much as the dews that fall in the night: and we know by experience, that for much longer time often no rain falls.

On the whole he reckons about two and twenty inches of rain to fall in his neighbourhood, near Hampton Court, in a year; which may be reaſonably allowed, conſidering the ſeveral quantities, which, on the niceſt calculation, have been computed to fall in ſeveral places, as computed by Dr. Derham,‖ being the reſult of many calculations, as follows:

"The proportion therefore which I ſhall now lay down "for the yearly rain of all places, whoſe rain I have had in-"formation of, are theſe.

‖ Philoſ. Tranſact. vol. IV. part II. page 82.

“ For Zurich (till further obſervations are made) thirty-two inches and a half.

“ For Piza (till further obſervations) forty-three inches and a quarter.

“ For Paris nineteen inches.

“ For Liſle twenty four inches.

“ For Townley in Lancaſhire, forty-two inches and “ a half.

“ For Upminſter, nineteen inches and a quarter; all of “ Engliſh meaſure.”

Dr. Hale further mentions, that Nic. Crequius found that twenty-eight inches depth evaporated in a whole year from water; and the evaporation of the earth is found to water as one thirteenth to one fortieth; about one third.

The evaporation of the earth in a year is 9-15. (ſomething above nine inches) from which 9-15 inches, there are to be deducted 3-39 inches (above three inches and a quarter) for circulating daily dews; and then there remain 5-76 inches (five inches and three quarters.) Which 5-76 inches deducted from the quantity of rain which falls in a year, there remains at leaſt 16-24 inches depth (ſixteen inches and near a quarter) to repleniſh the earth with moiſture for vegetation, and to ſupply the ſprings and rivers.

Hence we find two and twenty inches of rain in a year, is ſufficient for all the purpoſes of nature, in ſuch level countries as this about Teddington near Hampton Court.

But it plainly appears above, that the evaporation in ſummer frequently far exceeds all the dews and rains which fall then for a long time; and, conſequently, the heat would then deſtroy all plants, unleſs provided for ſome other way.

In order to find out what ſtores of moiſture nature had provided in the earth, againſt the dry ſummer ſeaſon: the laſt of July 1724, the doctor dug up three cubic feet of earth, three foot deep (and mentions the ſoil, &c. of the place.) And when thoſe ſeveral three cubic feet were become ſo dry as not to be fit for vegetation, on weighing them ſeveral times, he found the firſt foot (the higheſt) had loſt ſix pounds ten ounces of its one hundred and four pounds four ounces, being the original weight. That the ſecond had loſt ten pounds of its original weight of one hundred ſix pounds ſix ounces and a half. And that the third had loſt ſix pounds ten ounces of its original weight of one hundred eleven pounds and one third. Which together amount to twenty five pounds two ounces; and the doctor apprehends this a ſufficient reſervoir for plants in general, in dry ſummers and dry times: for ſeveral plants ſtrike deep into the earth, the root of the ſun-flower he made the experiment with, reached fifteen inches into the earth; and, conſequently, would draw moiſture much deeper in dry times than the depth its root reached.

It is neceſſary alſo to conſider the heat of the different times of the year, and how far that may effect the generality of plants; and what they can bear, before they will be burnt up and deſtroyed.

The doctor obſerves, plants will bear without prejudice a greater heat, than that when water is heated to the greateſt degree, he could bear his hand in without ſtirring it about; and mentions the following degrees of heat at different times:

" That in July the common noon-tide heat in the ſun " is about fifty degrees.

" That the heat of the air in the ſhade in July, is at a " medium thirty-eight degrees.

" That the May and June heat is from ſeventeen to " thirty degrees, which is the moſt general heat for the ge- " nerality of plants in which they flouriſh moſt, and make " their greateſt progreſs in growth.

" The autumnal and vernal heat may be reckoned from " ten to twenty degrees: the winter heat from the freezing " point to ten degrees."

" In July the heat muſt have a conſiderable influence at " two foot deep, by night as well as by day.

" The dew in a hot day cannot be of benefit to the roots, " but is imbibed into the vegetables.

" And nature has covered roots with a very fine thick " ſtrainer, that nothing ſhall be admitted into them, but " what can readily be carried off by perſpiration; vegetables " having no other proviſion for diſcharging their recre- " ment." (Page 85.)

Since a plentiful perſpiration is found ſo neceſſary for the health of a plant or tree, it is probable many of their diſtempers are owing to a ſtoppage of this by inclement air.

The perſpiration of men is often ſtopped to a fatal degree; and that of vegetables by inclement air, unkindly ſoils, or want of a genial moiſture.

By comparing the root, and the part of the plant above ground, we ſee the neceſſity of cutting off many branches

from

from a tranſplanted tree; for half the root being cut off, it has but half the nouriſhment, beſides its being put in a more looſe poſition.

This ſtrongly evinces the neceſſity of well watering new plantations.

How the ground is to be prepared for barley; and of ſteeping and ſowing it.

Barley requires as fine a tilth, and the ground to be in as good heart as any white corn whatſoever. Accordingly, before turnips came to be ſo much cultivated, the ground was generally prepared by a fallowing, a manuring, and ſeveral plowings. And the vale men, who get no turnips, uſe much of the ſame huſbandry, or elſe fold it with ſheep, or get twenty buſhels of pigeons dung, and ſpread it on an acre; when the barley is ſowed, and harrow it in with it.

Since turnips have prevailed ſo much, they are found to prepare the ground very well for barley, and now it is commonly ſowed after them.

Care muſt be taken to provide good ſeed, and the change of ſeed yearly, or once in two or three years, is very advantageous. In the caſe of barley, that from ſandy ſhort loam is found the beſt for ſtiff land, and that from ſtiff for ſandy.

In light ſoils it may be ſowed early in March, or any time after; but in ſtiff not till April, and ſometimes not till early in May. In ſuch late ſowing, if the ſeaſon does not prove favourable, there is hazard as to a crop; and it will be a late one.

Of ſteeping barley.

Whatever the ſeaſon is, a moderate ſteeping of barley, cannot be attended with any inconveniencies, and may produce great advantages; almoſt any of the ſteepings mentioned for wheat will make it grow.

The vale men ſteep it in ſalt and water in which an egg will ſwim, twelve hours; and ſome in water in which lime is diſſolved, or they ſift dry lime over it.

Rathripe barley is ſoon ripe; and there is little danger in ſowing it late. But there will be the more occaſion to ſteep it.

The common allowance for ſeed barley is from four to two buſhels to the acre; according to the time of ſowing, the ſort of grain, and the nature of the ſoil. Taking three buſhels in the medium, the produce being four quarters, it will be about eleven for one. Whereas if only one half of the three buſhels grew, and produced but two ſtems, that would be ſixty buſhels, which is twenty times the ſeed; and I have known ſome large fields to anſwer this calculation.

A late writer applies here the common ſaying, "The "more furrows the more corn," which is inconſiſtent with the drill huſbandry, and with ſetting the ſeeds at a great diſtance, which he recommends ſo warmly.

Mr. Hamilton in Scotland ſet a handful of barley at ſix inches diſtance; which, in three weeks, covered the ſurface and produced ſeven ſheaves; but they being ſtolen, he could not be ſure of the produce. (Append. p. 42.)

Miller thinks four buſhels too much, it being his opipinion, that we generally ſow too much of all grain. If the ſeed could be inſured againſt vermin and accidents, and be certain to grow, it would be no great difficulty to aſcertain the quantity.

Others ſeem of the ſame opinion; and this concerns all, or moſt ſorts of corn. The method there mentioned of ſowing the furrows by hand, may probably anſwer well for barley.

The plowing has been ſpoke of before, as alſo rolling; the latter of which is frequently neceſſary; and, when rightly timed, and prudently managed, is always advantageous. It ſhould be done upon the firſt ſhower after ſowing.

Of weeding and reaping of barley.

No corn is thought to ſuffer ſo much by weeds as barley: therefore a very particular care ought to be taken to clean thoſe out which are got into it.

This is uſually done in June, and if the corn be then thin, a little pigeons dung, or malt duſt, will be of great ſervice to it.

But if the ground be duly managed, it will not be filled with weeds carried thither with improper dung, which is often the caſe. And if the barley follow turnips as it now generally does, the preparation made for the turnips, and the twice hoeing them will cut up every riſing weed. If there ſhould ſtill remain any ſigns of this evil, the farmer may turn up the ſoil two or three times to the winter froſts, before there will be occaſion to ſow his barley. The being thus cleaned from weeds, will be very advantageous not only in the growing grain, but in the caſe of ſheering or ſoon houſing, loading, threſhing, and fitting for the market.

There is a very wide difference in the manner of reaping of barley, between the practice of the north country and the ſouth country farmers: the former generally ſheer and bind, and ſhock it clean and carefully as they do their wheat; by which means it is kept from all inconveniences.

But as this is a corn not ſubject to ſhed, and the ſouth country farmers principal concern is, to take effectual care of their wheat; they commonly mow this; and a man will this way cut two acres a day, which is a much quicker way of diſpatching it, and ſo far is done at a much leſs expence. After this, in ſome places, they let it lie a day or two, and then turn it: and after a day or two more, as the weather favours, and the weeds are killed, they gather it in cocks as hay, and then load it.

In other places they let it lie after it's mowed, till they apprehend it is dry enough to load, though it may be many days, and rake it both ways on heaps, turning it up a little before they load it. In thoſe places where they meddle not with it till they are juſt ready to load, they are very nice in laying the ears on that part of the ſwaſh where the ſcythe points out, and is the higheſt; which they apprehend keeps it hollow, and lets the wind under it to dry it; and they are alſo careful in keeping the ears even together when they rake it. In ſome places they have forks with three large tines, two under, and one riſing a good deal above it, by which they ſhove the barley both ways on an heap.

The Chelſea and Fulham farmers, who are thought to excel in the management of this grain, will, in a dry time, ſometimes cock it in a morning, whilſt the dew is on it, to give it a little ſweat. A little rain on it whilſt it lies in the ſwaſh, is thought rather advantageous than prejudical to it.

Of the produce and advantages of barley.

A late writer mentions the common produce of barley to be, two and a half or three quarters of an acre; but that he has ſometimes known four quarters. He ſpeaks of what is got amongſt the middling farmers, ſince he himſelf mentions much greater quantities of barley on an acre occaſionally.

Four quarters in the common courſe of huſbandry, is reckoned a good crop; but that allowing for the uſual trouble and expence of fallowing, dunging and repeated plowings, will not anſwer ſo well as is thought. Barley being reckoned one half the value of wheat, the whole produce would be two pounds ſixteen ſhillings, and deducting the outgoings, that is, ſeed three buſhels, ſix ſhillings; the uſual plowings, ſowing, harrowing, and rolling, twelve ſhillings; weeding, reaping, threſhing, and cleaning, the ſtraw being of little value, eight ſhillings; extraordinary dung or dreſſing, one pound; rent eight ſhillings, in the whole two pounds fourteen ſhillings: there is very ſmall profit.

The common profit of beans and peaſe is better, and they help to improve the ground for a crop of wheat; whereas it is generally allowed, that barley impoveriſhes land very much, and on moderate computations a crop of oats, clover, or turnips, will be found to pay better.

This is according to the old method; but by the late improvements made by the new huſbandry, a conſiderably greater profit ariſes from a barley crop, taking the produce to be the ſame; for the loſs of a fallow year is anſwered by a crop of turnips, which will pay the rent and what manure is neceſſary, and the huſbandry of them; by which method much leſs plowing is neceſſary for the barley; and by this means, all things conſidered, one half of the outgoings in the preparing for barley is ſaved, which conſequently is ſo much clear gain to the farmer.

But there is another conſiderable advantage from barley, according to the new courſe of huſbandry; which is, that of all grains, it is the beſt qualified to admit the ſowing of a beneficial crop of clover in it. And clover being the beſt preparative for a good crop of wheat, at an eaſy expence, and wheat paying generally much the beſt of all grain, the promoting ſo excellent a crop, may reaſonably be allowed an advantage.

A modern writer thinks ſowing clover with barley, no good practice; and is for ſowing it alone in Auguſt, thinking the ſowing it with clover to be the loſs of a year: but in this he is miſtaken, ſince by ſowing the clover with barley in the ſpring, it gains as much time as it grows from the ſpring till Auguſt, when it is ſuppoſed to be ſowed alone, and all is in the ſame year.

As to the goodneſs of the clover, when ſowed with barley,

ley, I have enquired of ſenſible farmers, and was anſwered that they had as good crops of clover when ſowed with barley, as could well grow: I have ſeen ſome ſuch myſelf, and particularly one this ſummer, at Mr. Wood's, at Brockſhall near Kelvedon in Eſſex; which being very good, I ſhall here give ſome of the particulars relating to it.

Laſt year he laid down a field of twelve acres with clover, and this May 1755, he turned into it to eat it, twelve horſes, eleven cows and a bull, ten oxen, eight heifers, one hundred ſheep, and thirty hogs; and he kept them there till about midſummer, and then ſowed it for ſeed.

I ſaw it finely grown in September, and about the end of that month, he got from it four and twenty loads of good clover. The value of all theſe cannot be reckoned at leſs than ſixty pounds.

The produce of barley being frequently much larger than what is above mentioned, this may well deſerve ſome conſideration.

Miller ſays it is common to have ten, twelve, or more ſtems from one corn; and that he has counted ſeventy ſtalks of barley from one root, which had been tranſplanted.

In the experiments mentioned before, the three ſpires of barley ſteeped and ſet at two foot diſtance, had ſixty, ſixty-five, and ſixty-ſeven, ſtalks apiece from their ſingle grain and root, with every one an ear, and forty or more corns apiece in them. This great ſucceſs the author thinks proceeded not ſo much perhaps from the grain having been ſteeped, as from the fertility and goodneſs of the ſoil, and their competent diſtance.

The ſame gentleman further obſerved, that new ſhoots continually ſtruck up from the roots; ſo that here, if the invigorating heat of the ſun had not been cooled and weakened by the approach of the winter ſeaſon, there would have been continually new ripe corn, and empty ears on the ſame root.*

This may afford matter for many curious obſervations.

But to conſider what Miller mentions, and take his loweſt eſtimate of ten ſtems to one corn, and twenty corns in a ſtem: this on the ſuppoſition that only one buſhel of the ſeed barley grew, would be two hundred buſhels for one, or twenty-five quarters to an acre; which is a produce not to be much expected.

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* Philoſ. Tranſact, vol IV, 2d part, p. 310—311.

If ſuch great produce be feaſible, the want of it muſt ariſe either from the not having good ſeed, and the not ordering it well, or from the not giving it compaſs of ground to grow in.

The two former may be eaſily remedied, by common care, with a very little or no additional expence; and as to the proper preparation of the ground, that ſhould be done in the beſt manner, whether you ſow corn thick or thin, in the common or in the drill way; or if you ſet it, ſuch good managing of the ground can be no great addition to what the farmer lays out in preparing for barley, a crown extraordinary would go a great way, either in providing any ſteeping, or in brining the land to any degree of fineneſs; or indeed in both.

This author mentions, that the barley corn which produced the moſt grain was tranſplanted; and under the head of wheat I have mentioned ſeveral advantages ariſing from that method.

How far ſuch a procedure may improve the grain, may deſerve the conſideration of the curious: to name only the improvements made in aſparagus, which is known to grow wild in the meadows in ſome parts of England, and there is not eatable. It hath obtained its delicate taſte from the ſeveral tranſplantations, and different methods of management it hath met with under the gardener's care. We are ſenſible what changes appear in barley, when made into malt, what alterations are made in the flour of wheat by the baker, when he improves it into bread; and the changes of milk into butter and cheeſe, by the methods uſed in making them, were they not ſo common would be matters of ſurprize.

There are ſeveral inſtances of the great produce of barley. Platt's friend plowed twenty acres of graſs ground, after croſs plowed it, and harrowed it three or four times: he ſowed it in the beginning of March, and had thirty quarters per acre, and ſold it that year at four ſhillings per quarter.

Sprat barley has often produced ten or eleven quarters when ſowed in March, though in other ſoils but three or four.

M. Nunn, in the County of Eſſex, had laſt year a large field of barley, which together produced eight quarters per acre. This is a good crop; and what land proper for barley, with good management, may reaſonably be thought to produce.

Of Rye.

Rye has been thought the next bread corn to wheat, and was formerly much uſed for that purpoſe, and is ſo ſtill in ſome places; ſometimes alone, but then it has a ſweetneſs, which is diſagreeable to thoſe who are not uſed to it, and ſubjects many to cholicks; the bread is alſo black and heavy.

A ſmall quantity of it was formerly, and ſtill is in ſeveral places, mixed with wheat in making of bread, on account of its keeping moiſt, and then it is attended with no ill conſequences. It was the more cultivated on account of its being the product of barren, gravelly, ſandy land, which was then thought capable of producing nothing elſe, or little worth the farmer's care.

The common or winter rye requires a ſummer's fallow, and more expence and trouble in the management, than it is found to anſwer well; ſince the great improvements made of thoſe dry ſandy ſoils proper for it, by ſowing of turnips, and foreign graſſes, and the great profit made by them; and from the ſeveral ſpecies of corn, they give the farmer an opportunity of raiſing much more advantageouſly. This muſt ſink it in the huſbandman's eſteem.

There are two ſorts of rye: Firſt, the common or winter rye. Second, the leſſer or ſpring rye.

The firſt is what is uſually propagated, and generally on dry barren land, where better corn will not grow.

The ſecond is to be ſown in the ſpring, about the ſame time when oats are. It is apt to run into ſtraw if it prove a wet ſeaſon, and is generally lighter than the other: however, it may be conveniently uſed where wheat or other autumn crops have miſcarried.

Two buſhels are allowed for ſeed to an acre, and four loads generally reckoned a middling crop: it uſually carries equal price with barley, about one half of the price of wheat.

In ſeveral places they ſow rye together with wheat on the ſame ground, and then it is called maſlen, that is, miſcellane: it will then bear a price in proportion to the quantity of wheat.

The beſt judges think this ill huſbandry, ſince as the rye is ripe before the wheat, and muſt ſtand till they are cut together,

gether, it will ſhed a good deal of its grain; and what is more, the grains when ſo mixed ſeldom make a bread that thoſe can well bear, who have been uſed to wheat. Rye producing a ſpirit, is now ſaid to be much uſed for that purpoſe, and ſo far may ſave wheat.

Rye is a quick grower, and the common ſort, as well as the other, ſometimes is ſowed in ſpring, when wheat miſcarries. The ſmaller rye is very proper for this purpoſe, as it is uſually ripe at the common time of harveſt. The common ſort is ſometimes ſowed late, in order to be plowed in to fertilize the ground for a better ſpecies of grain.

There is a more beneficial proſpect of ſowing it in autumn, which is to provide food for ewes and lambs in the ſpring, when turnips and coleſeed are gone, and before any other graſſes are grown. It may be ſowed for this purpoſe either on land prepared particularly, or on the wheat land after the corn is carried off, or on other ſtubbles plowed up, or where turnips have failed. It will probably anſwer expectation, whichever method is taken for this purpoſe.

It is the beſt proof of a man's being a good farmer, to provide food for his cattle and ſheep the whole year, and to have a further view for a ſecond proviſion for his ewes and lambs, in caſe any of the former ſhould miſcarry.

All this he may certainly generally do, if he will conſider the reſpective times. The common natural, and the ſeveral artificial graſſes, or turnips, will continue at the latter end of the year, and alſo when he may expect any of them to come into his aſſiſtance in the ſpring: and then think of and provide ſuch other ſupports for them in the time. None of them are to be had in the uſual courſe of things, but by ſowing either turnips, rye, or coleſeed, by the help of one or other of which he need not much fear but he may have a plentiful proviſion for his ſtock all the year round. For which purpoſe turnips may be made more ſerviceable than is at preſent imagined.

It is for the want of this care, to provide for ſheep in winter and ſpring, that in many places in the north they are obliged to prevent their ewes from having lambs, till they have natural graſs on the ground, to help them to milk to ſupport them, which is often not till the end of April, and ſometimes not till the beginning of May: and then they are obliged to eat their beſt mowing grounds ſometimes to the twentieth of May, before they can turn their ſheep to the commons. If a dry time ſucceeds, theſe grounds are burnt up, and their expected product of hay from their beſt land in a great meaſure deſtroyed.

Why may not rye be ſowed for the purpoſes above-mentioned amongſt turnips, and anſwer the farmer's expectation? Eſpecially as the ground on which turnips are commonly ſowed, is better prepared, and of a better nature, and in better heart than the land commonly allotted for the growth of rye; eſpecially where turnips are ſowed after the drill manner.

In plentiful years rye may be given to fowl, or hogs, which delight in it, and will feed very well on it, when ground, and made into a paſte: but then they ſhould always have water, and a few beans or peaſe at the laſt, to harden their fat.

This grain is very ſubject to grow in the ear, if wet comes to it; and it will be ſoon damaged if green weeds are mixed with it: ſo that particular care muſt be taken of it in theſe reſpects; to let it have time in the field, to prevent the weeds making it too damp in the barn which will make the corn muſty.

The keeping it in the chaff, on a dry floor, is proper for the preſerving it ſweet after it is threſhed, the dry chaff imbibing any moiſture which may happen. This method has been mentioned for preſerving wheat, and is uſeful in ſeveral other grains.

Of the Oat.

The oat is generally placed next after barley, but is eſteemed of much leſs value, and is accordingly leſs regarded: though, if we come cooly to conſider the profit it produces, and at how little comparative expence, we ſhall find it equal to barley in all uſes except one, and ſuperior to it in many; and in reſpect of the expence and trouble attending each, and the profit they produce, it will be found preferable to barley, and perhaps to all other grain except wheat.

The oat grows in all countries, and all ſorts of land; but they are miſtaken, who affirm it will grow in poor land as well as rich. Indeed no land can be too rich for it, but whoever expects a good crop of it from poor land, will find himſelf ſadly diſappointed. There is one undoubted proof of its doing well in rich land, it is generally firſt ſown when the richeſt fields and meadows are broke up (to take off what they call the edge of the ſoil) the richneſs of which would make wheat run too much into ſtraw.

How oats will anſwer in a rich ſoil, I experienced many years ſince, on breaking up a meadow of three acres, inclined to moiſture, on a gentle deſcent, which, with one plowing, and no farther trouble, it being a dry ſummer, produced ſtems in general between five and ſix foot high, and very well headed.

In the ſame neighbourhood black oats were ſowed ſeventeen years ſucceſſively, in an undivided field, ſeveral times manured, and brought tolerable good crops to the laſt.

This was lime-ſtone land, and lay on a deſcent, and I apprehended might receive ſome advantage from the lands above it, by the waſh deſcending from them.

The oat is diſtinguiſhed from other corn, by the grain growing in looſe panicles.

There are three principal ſorts of it.

1. The common, or manured white.

2. The black oats: in ſome parts of England more ſowed than the former.

3. The naked oat: much ſowed in Cornwall.

To theſe we may add two others, very conſiderable.

4. The red or brown oats; and ſome, I ſuppoſe, reckon theſe the red, and the grey, and all of them compriſe the large white Poland oat, under the name of white. The ſeed of it being brought from Poland, gave it that name. And as it degenerates here in a few years, it is often brought freſh from thence. It is apt to ſhed after rain.

The white oat has the larger kernel, and turns out more meal in the grinding than the black: the meal of a buſhel of the white being near three pecks from the miln, and that of the black but two: but the white oat requires richer land, and will not bear cold ſo well. As to every other article, but what they call the Yield, the black is equal to the white, if not ſuperior.

The black oat does not produce equal quantity of meal, which the white does, buſhel for buſhel; but the meal of the black is as white as the other, and is ſweeter. The black is moſt made into bread, and the moſt eaten as ſuch, both in the northern and ſome of the midland counties of England, and is generally allowed to do leſs injury to the ground than the others. It is more generally cultivated in Scotland, than either the common, white, or the Poland oat: nor does it need any mixture of wheat to make it wholſome or palatable.

The uſes of oats.

Oats being a very temperate mild grain, are fit for almoſt all uſes and purpoſes any ſorts of corn can be, and being hardy will grow in almoſt any ſoil, and that with the leaſt culture of any grain whatſoever: being very prolifick it will, all things conſidered, be found the moſt profitable of any grain (except wheat) and may, in one ſenſe, be ſaid to be an improver of land, as it paves the way for its producing other ſorts of grain.

It is known what great fatigues and labours the Scotch have gone through, when ſupported only by a ſmall quantity of oatmeal, which is a manifeſt proof of the goodneſs of that grain: and it is well known that moſt of the northern peaſants have little elſe to ſupport them in their hard labours.

Oats, when malted, make a pleaſant ale: and they are uſed in the kitchen in many particulars, in which the flour is preferred to the flour of all other grain.

It is proper for feeding all ſorts of fowls, and ſwine, making the ſweeteſt bacon of all food: though it is thought very adviſeable to give the ſwine a few peaſe, toward the end.

The excellency of oats, as the beſt and moſt wholeſome food for horſes, is allowed by all; and when they have been kept till they are thoroughly dry, there is no danger of thoſe diſtempers which commonly attend thoſe fed on beans.

They are equally uſeful for feeding the cow or the ewe, to help them to milk, and to nouriſh their young; and at the ſame time will ſupport the ox in his labour, or feed him fat for the ſlaughter. The ſtraw is valuable for food for beaſts, beyond that of all grain, and when ſome of the lighteſt oats are left in it, and only the beſt threſhed out (which is called batting) it is very good food for beaſts.

Of the ſoils proper for oats.

As to the ſoils, it has been mention'd that they will grow on all, and do very well on moſt, where a crop of corn can be reaſonably expected; yet oats certainly do beſt on the beſt ground; for which we may appeal to common experience, when they are ſown at the firſt breaking up good ground, or when the ground is well manured for them.

Oats will do with the worſt tilths, and in the pooreſt ground, and ſeldom have that culture they deſerve: dry ground will agree with them as well as wet. I have had good crops of them after turnips eaten on the land without any other manure, the produce being from ſix to eight quarters an acre.

The ſeed uſually allowed for an acre is four buſhels; but in ſeveral places they ſow ſix where the ground is poor, or where ill cuſtom has prevailed. The farmer ought to be careful in getting what is good, and changing it from different ſoils. It is ſeldom oats are ſteeped, nor do they want it as to their certain growing.

Formerly they uſed not to ſow oats till March, but of late they commonly plow for them at the beginning of February, and ſow and harrow them in from the middle of that month: they find by experience, that their crops are ripe ſooner then they formerly were when ſowed later. And as this is their principal, if not only grain in many places; they weed it carefully, but have not had the beneficial cuſtom of rolling it long practiſed.

In reaping of oats, the north far exceeds the ſouth farmers: they generally ſhear their oats as carefully, and as clean from weeds as others do their wheat; and ſome of them bind their ſheaves as they ſhear them: but others more prudently leave them open all the day, by which the middle of the ſheaf gets dry; and then bind them up, and ſet them in ſhocks, ten or twelve in a ſhock. Two called hooders, being gently drawn over the tops of the others. They will ſtand thus many days without damage. The uſual price of ſhearing is about three half-pence per thrave, and the north countrymen are dextrous at this.

If the ſowing be deferred till April, it ſhould be well harrowed in: in ſome places the wetneſs of the land obliges the farmer to ſow ſo late.

Miller mentions oats as a profitable grain, and ſays the uſual produce is five and twenty buſhels; though he has ſometimes known more than thirty on an acre. This is a very poor account of the produce of this grain, ſince four quarters are common on very indifferent ground; ſix or ſeven is no extraordinary crop; and ten quarters are frequently had with only one plowing, without any further trouble.

I had an hundred buſhels of black oats on an acre, with only once plowing, and that without any rolling or manuring whatſoever; and it is common to have forty or fifty thraves on an acre; each thrave conſiſting of four and twenty ſheaves, and each thrave yielding from one buſhel three pecks, to two buſhels one peck: ſo that an hundred buſhels on an acre is nothing extraordinary. An experienced farmer in Staffordſhire had three hundred thraves of good black oats on five acres on dry lime-ſtone ground, with only common huſbandry, and once plowing. This was thought a very good crop, but not ſuch a one as to occaſion any amazement, ſeven, eight and ten quarters being very common. To this I ſhall add one inſtance more; which, tho' nothing extraordinary to me, will appear ſo to thoſe who think four quarters of oats a good crop.

This inſtance is, that of a crop of oats of a pretty large field of a farmer in the iſle of Merſey in Eſſex; which the laſt year brought him eight quarters and an half of oats an acre through the whole field.

This crop followed one of wheat, and he managed his land after the following manner: it being a very dry time after wheat harveſt, he ſet fire to the ſtubble, and burnt it off clean; after this he gave the field three tilths, and laid it on a round ridge all winter, and then ſowed it with oats in the ſpring.

The three plowings may be thought an extraordinary expence; but where the ground is kept in a good courſe of tillage, and a man with two horſes can plow two acres a day, the expence is not great. An acre not engaging ſuch a team above two days at the moſt for three plowings; and a conſiderable benefit to the enſuing crop may be reaſonably expected, as well as the keeping the land clean from weeds.

A popular writer ſays, "people ſow oats for two reaſons, "one becauſe they lower the ſtrength of new ground, and "the other to give old ground the benefit of change of "ſeed;" yet this perſon allows five quarters on an acre as a common crop, and ſays, he has known nine, and that "they have often ten quarters an acre, when they manure "the ground for oats;" by his own confeſſion and reaſoning, a common crop of oats far exceeds a common crop of barley. Where the land has the ſame manuring for oats which barley requires, it hath the crop of oats double that of barley; and, conſequently, is preferable, for the bare profit they will reſpectively bring to the farmer, the prices of the one and the other not being uſually much different.

There are three conſiderable advantages the oat claims, it will grow and pay very well on thoſe lands, which will not anſwer to any other grain: this advantage is allow'd the oat by all who write on this ſubject.

The next is, that it is certain to bring a good crop, on the firſt breaking up any good meadows or paſture ground; in this caſe it commonly produces a very good crop, without any expence but one plowing and ſowing; and prepares the ſame ground much better than it could be any other way for a ſucceeding crop of wheat, which is ſo eagerly ſought for in all the corn countries.

The third advantage of the oat is, the benefit ariſing from the goodneſs of the ſtraw for cattle; it is ſold in our north countries, from four-pence to ſix-pence a thrave; conſequently, tolerable good crops may on a medium be valued at twenty ſhillings per acre: though wheat ſtraw excels it for thatch, oats will laſt ſeveral years for that uſe.

Another advantage it certainly has over wheat and barley, that it is got with leſs plowing, requires not ſo fine a tilth, and not near ſo much manuring as they do. It is not ſubject to ſmut, ſo prejudicial to wheat, and ſuffers the leaſt in a wet ſeaſon of all grain, being as ſoon dry as any, and ſuffering the leaſt when houſed wet.

It gives the farmer an opportunity of varying his grain, and it ſeems not to diſlike the following any other grain.

It allows a long time after other crops are got off the ground, for the meliorating the land by lying expoſed in fallows, and to winter froſts.

Laſtly, it is ſuperior to all grain but barley in receiving the foreign graſſes to be ſowed with it; on which a great part of the advantage of the new huſbandry particularly depends.

A late writer ſays: "an oat crop is the propereſt of all "others, to ſow any of the graſs ſeeds amongſt, if the "ground is in heart, becauſe the ſtalks of oats are apt to "ſtand ſtiffer than barley, and the graſs is in leſs danger of "being ſpoiled.

In this caſe I ſhall not inſiſt on its ſuperiority to barley, but only ſay it is equal to it. The oat has other ſufficient advantages above the barley.

A calculation of the profits of oats.

I ſhall take the produce of a crop of oats only at ſix quarters, which may be reckoned a moderate crop.

Eſtimating the buſhel of oats at one ſixth leſs than the value of barley, the oats will then be to be reckoned at twenty-pence the buſhel; which being thirteen ſhillings and four-pence per quarter, ſix quarters will amount to four pounds: the ſtraw will above anſwer the ſheering, loading, threſhing and cleaning. The other out goings will generally ſtand thus: ſeed four buſhels, ſix and eight-pence; plowing, ſowing, harrowing, and rolling, ſix ſhillings and eight-pence: rent reckoned as the barley, eight ſhillings. And though oats have very ſeldom any manure laid on the land in particular for them; yet, in this caſe, I will allow ten ſhillings and eight-pence for manure. So that the outgoings will be in the whole, all expences and trouble allowed for, one pound twelve ſhillings; which, deducted from four pounds, the produce of the crop of oats, there will remain two pounds eight ſhillings clear profit to the farmer. Whereas the clear profit of barley, all out-goings allowed for, amounted to but about eight ſhillings. If oats are ſometimes leſs, ſo is barley frequently; and if barley ſometimes exceed four quarters, oats much oftner exceed ſix. On the whole, the oat ſeems to have a clear preference to barley, as to the profit accruing to the farmer from them reſpectively: on an average, the oat will be found to produce twelve for one; and few other ſorts of grain can pretend to do more.

In this calculation of the profit, I reckon on the white oat.

Moſt writers inſinuate the great advantage of oats to be, that they would grow in the north, where nothing elſe would; and even including in that ſome of our very midland counties, as Derbyſhire and Staffordſhire. It may not be amiſs to conſider this matter, that the farmer may not be diſcouraged from attempting to raiſe good corn, fruit and vegetables, in whatever part providence has placed him.

It was long before it was known, that a cherry would grow in Italy, or a grape in France; much leſs either of them in Britain. Sir William Temple, was ſtrongly of opinion, that no better wall fruit than a plumb would grow beyond Northampton.

It is not many years ſince, in the pariſh of Aſheover, near Cheſterfield, in the county of Derby, no wheat was got, though it is now in great plenty; and all owing to a woman married from a corn country, who perſuaded her huſband to try, as there was lime enough: this proving ſucceſsful, encouraged others.

Going once from Cheſhire to London, I ſaw barley cut and in the ſhock, between Winnington Bridge and North-

wych;

wych; and no other corn of any ſort cut in all the way to London.

Mr. Hamilton, who reſided ten years there, and made it his buſineſs to inform himſelf in huſbandry, ſays, "They "there had as good and as large carrots, cabbage, and parſ-"nips, as ever he ſaw in England."

Having paved the way for a favourable hearing by theſe inſtances, this being a matter of great concern, I ſhall take the liberty to enlarge a little on this point.

Vegetables principally owe their excellence to the nature of the ſoil, the goodneſs of the air, a proper ſituation, ſhelter, and a kindly ſuitable heat; all but the laſt are undoubtedly to be had in all parts of the kingdom, as well as near London; and in order to ſet the point of warmth in a proper light, I will give the tables of the different quantities of heat, at different parts of the kingdom, calculated by thoſe who are well verſed in theſe affairs.

Tables of the quantity of the ſun's heat at noon, when it is vertical at the ſummer ſolſtice, the two equinoxes, and the ſun's entrance into Taurus, and Virgo, for the ſeveral latitudes from 44° to 56°.

In theſe I ſhall mention only thoſe we are concerned in, beginning at the Lizard point, and ending at Edinburgh.

Degrees of Latitude.	Names of Places.	Heat, *June* 10.	Heat, *Ap.* 10. and *Aug.* 12.	Heat, *March* 10. *Sept.* 11.
Vert. Sun	———	100	100	100
50	The Lizard ———	71	49	26
51	———	69	47	24
51½	London ———	68	46	23½
52	———	67	45	23
52½	Yelverton, in Northamptonſhire	66	44	22½
53	———	65	43	22
53⅓	Lincoln ———	64	42	21
54	———	63	41	20
55	Newcaſtle ———	62	38	19
56	Edinburgh ———	60	37	18

The gentleman who made theſe tables juſtly obſerves, that tho' they ſhew the real difference of the ſun's meridian heat, in different latitudes, they do not account for the greater number of hours of the ſun being above the horizon, which a northern latitude has more than a ſouthern one; which is the principal thing as to our preſent purpoſe.

Therefore he aſſures the reader, in general, and by one round number, that during all the ſummer ſeaſon, betwixt the two equinoxes, there are one hundred hours of ſunſhine at Durham, more than there are at Plymouth.

There are ſeveral other particulars which, under this head, may be taken into conſideration, in behalf of thoſe who live northward, which may ſet them on the level with ſome of the more ſouthern countries; beſides the greater number of hours of ſunſhine.

As firſt, the very different good ſorts of ſoil frequently found in the northern counties, which all allow to be a conſiderable article in this point, when compared with ſeveral ſoils in the ſouth.

Another advantage is, that in ſeveral of the hilly countries, there are frequent vallies ſo well guarded by thoſe hills, and of ſo good a ſoil by nature, and the produce of which is ſo promoted by the reflection of the ſun's heat, by the poſition of the hills, that they are as forward as any places in the ſouth: allowing theſe the ſame culture, they would have as early and a much ſweeter produce than the ground near London, and would produce all ſorts of vegetables, and moſt ſorts of curious fruits, equal to the beſt in the ſouthern countries.

I could name ſeveral places which would anſwer what is above-mentioned, but ſhall rather take notice of thoſe more generally known.

Chatſworth, the ſeat of the Duke of Devonſhire, though far from a kindly ſituation, or placed on a good ſoil, is managed ſo as to produce moſt things equal in goodneſs to thoſe in the ſouth.

Haddon, two miles from it, the ancient ſeat of the Duke of Rutland's family, is on a better (lime-ſtone ſoil) and before it was neglected, produced as good vegetables and fruit, as then were found in moſt parts of the kingdom. And ſtill, though only under a common gardener's care, bears fruits, which many years were ſent to Buxton or Chatſworth. Of late years Buxton, which was always thought to be placed in as barren a place, and as unkind ſituation as could well be imagined, and which, within my memory, uſed to fetch greens and vegetables twenty miles round, to furniſh the gueſts; even this barren place is now ſo managed, as to produce every thing neceſſary and uſeful, and many things curious.

Theſe inſtances, with what was before mentioned, ſhew that the northern countries are capable of producing the grains and vegetables which ſome would appropriate to the ſouth.

The whole earth is reckoned naturally barren, as to the production of corn; and clayey land, which was uſually eſteemed the moſt unkind of all, by proper culture, is brought to produce the beſt of all grains.

A clergyman, who made this point his peculiar concern, declares, that after living in the ſouthern parts of England, the firſt part of his life, on his removal to Durham, he never eat more or better fruit, even of the later kind (except grapes) than after he came into that biſhoprick; and judged a degree or two will have little influence as to fruit, in compariſon of the ſoil and ſituation.

On the whole it appears, the moſt conſiderable difference of heat and warmth, for ripening fruit, corn, or other vegetables, ariſes principally from the nature and circumſtances of ſoils and ſituations, from a place lying on the ſouth or north ſide of a hill, from its being on the top of a cold hill or in a vale; from its being ſheltered or not ſheltered from winds; from its lying on a cold clay, or in a warm ſand or gravel.

It is plain that a garden, or land lying on an eaſy ſlope on the ſouth ſide of an hill, receives more of the ſun's rays than the ſame quantity of ground lying on a plain, and hath more real advantage of heat from the ſun, than ſeveral degrees of ſouthern latitude would give it: and the argument is ſtronger, if the ground in the ſouth ſlope to the north; the ſame thing is to be ſaid with reſpect to cold clays, and warm gravels, they being guarded or not guarded from winds, and ſo on.

As to the inconveniencies common to the whole iſland, as the inequalities of our ſeaſons, violence of winds, and ſudden changes of our weather, they cannot be ſaid to be more prejudicial to the north than the ſouth: on the contrary, according to Dr. Derham's hiſtory of our great froſt, the ſouth ſuffered then much more than the north.

Theſe obſervations may not only reconcile the farmer to a northern ſituation, but encourage him to equal induſtry, with thoſe who are ſituated more ſouth.

Hence alſo they may draw uſeful obſervations, as to the ordering their grain and their roots, from the advantages they may reap from the different ſoils, the poſition of their grounds, as to the north and ſouth ſhelter: it being commonly obſerved, that one ſide of a corn land, in many ſituations, is thinner than the other.

Of keeping of oats.

The oat may be kept ſecure in the eaſieſt manner. It is little ſubject to receive damage in the barn or ſtack, on account of the nature of the ſtraw, which is ſweet and dry, and the leaſt ſubject to be muſty of any.

Oats will alſo keep very well when threſhed, and laid by in the chaff, without further trouble, provided they be not laid by wet, or wet permitted to come to them, in ſuch a degree as would ſpoil any other corn.

The principal method of ſecuring the product of this grain, where it is uſed as bread, is by firſt grinding it into meal, and then putting it cloſe down in a cheſt of wood. This is ſo well known in the countries where the meal is uſed for bread, that there is ſcarce a family but has one of theſe cheſts, or arks, kept under lock and key, either in the dwelling houſe, or ſome building adjoining to it, or in their barns. Thoſe who are able to keep it for a riſing market, ſell it at the ſame proportionable profit, as thoſe do who can ſave wheat till it riſes.

Of the Bean.

The bean was much eſteemed by the ancients; but it is diſputed, whether their bean was the ſame which is now uſually ſowed: ſince it is certain from Theophraſtus and Dioſcorides, that the bean of the ancients was ſmall and round.

It ſeems incredible, that a pulſe ſo common, and of ſuch daily uſe, ſhould change its name, and have another ſubſtituted in its place.

If a conjecture may be allowed, the bean of the ancients, as deſcrib'd by Mr. Ray, to be ſmall and round, and which was formerly ſo much eaten, ſeems more like what is now called the magazan bean, than that we commonly ſow.

The beans now in uſe are principally two; the leſs or horſe beans, ſowed in the fields. And the great garden beans.

Pythagoras forbad his diſciples meddling with beans; he meant that they ſhould abſtain from meddling with affairs of the republick; becauſe the ancients uſed beans in electing their magiſtrates as balls when they voted.

The bean has a papilionaceous flower, which is followed by a long pod, filled with large ſeeds: the ſtalks are firm and hollow, and the leaves grow by pairs, and are faſtened to a middle rib.

Farmers ſeldom ſow any but the horſe beans in open fields: but many of thoſe called garden beans are now much cultivated in the fields near London, and in other places, and are equally capable of being managed after that manner, with greater advantage to the owner. A garden is but a little field, well cultivated; and what we call a field, a great garden capable of all the ſame methods of management. The large field managed with the ſame proportionable induſtry, manure, and care, will produce a proportionable profit, in the caſe of beans, and alſo all ſorts of vegetables, as will evidently appear to any perſon who will but walk into the fields about Chelſea, Fulham, Batterſea, and ſo on.

The principal varieties are theſe.

1. The common field bean.

2. The early Liſbon, or Portugal bean; commonly ſowed by gardeners, one of the earlieſt ripe, and principally valuable on that account: it is often ſown in October or November, and does not require ſo much ſun, as a proper ſhelter by hedges.

Derham obſerves, "that ſnow preſerves bodies thirty "years uncorrupted, and guards the corn againſt cold "piercing winds,* and in his hiſtory of the great froſt,† he obſerved, "that many ſmall fields of wheat eſcaped pretty "well, where fenced with thick high hedges againſt the cold "winds; eſpecially where they were covered long with "ſnow. Thoſe ſuffered more where the winds blew off the "ſnow; and thoſe where the beſt wheat which were on ſuch "pieces as lay on gentle deſcents, facing the weſt or ſouth "weſt, eſpecially when guarded on the eaſt ſide with a hill, "or a wood, which fenced off the cold piercing eaſterly, "and north eaſterly winds."

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* Phyſico Theol. page 34.

† Philoſ. Tranſact. Vol. IV. page 122.

Several other curious perſons confirm the ſame, and obſerve, "that eaſterly winds do more miſchief ſometimes in "ſpring after a few favourable days, than all the winter "froſts, ſince by ſudden changes of the weather, the "paſſages in trees and plants are ſtopped; the crude ſap "ſetting becomes a diſeaſe in trees equal to that of chilblanes "in juvenile blood, which ſometimes takes whole trees, "and ſometimes branches only.*

This being a matter of conſequence, and applicable to many caſes, I thought it might properly be inſerted here: both for the ſake of the farmer in the field, and every private perſon in their reſpective gardens.

It was common to plant early beans, and things of that kind under walls, that they might have the benefit of the ſun: but experience inſtructs us, that thoſe ſituations are frequently fatal, and therefore moſt now rather chuſe to ſet them againſt hedges, or reed hedges are run along the garden for that purpoſe, yet with the greateſt care, and the deſired ſucceſs, they will only be found about a week or ten days earlier than thoſe ſet in the ſpring.

The ſmall Spaniſh bean comes in quickly after the Liſbon, and is a ſweeter, and will conſequently be preferred to the other.

The broad Spaniſh bean is a good bearer, and comes in before the common ſorts.

The Sandwich bean ſucceeds ſoon after the Spaniſh, and is almoſt as big as the Windſor, and is a plentiful bearer, and a hardy bean; and conſequently may be ſown much ſooner by a month.

The toker bean is a great bearer, and comes in about the ſame time with the Windſor.

The bloſſom beans, which are black and white, are very green when boiled, and very ſweet; but the ſeed is ſubject to degenerate.

The Windſor bean is the beſt of all; and when it has room, and a good ſoil, is a plentiful bearer, and very large.

Theſe are ſeldom planted till Chriſtmas, becauſe they bear not the froſts, ſo they generally come in June and July.

The magazan bean is eſteemed the firſt and beſt ſort of early beans now known. The ſeeds are ſmaller than thoſe of the horſe bean.

If theſe are ſown in October under a warm hedge, pale, and ſo on, and earthed up as they riſe, they will be ready in May, and bear plentifully.

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* Vol. II. page 158. 755.

Theſe ſeeds were brought from the coaſts of Africa by the Portugueſe, and from them to us. When the ſeed is ſaved here they grow larger, but ripen not ſo ſoon.

Theſe ſeveral ſorts differ in ſhape, and require different times of ſetting: they vary in their qualities of bearing the hard weather better or worſe. Notwithſtanding all which, they are only ſeminal variations: for which reaſon great care ought to be taken of procuring proper ſeeds.

Beans when about two inches high, ſhould be carefully earthed up, and ſo as they riſe two or three times; and, in very ſevere weather, ſhould be cover'd with peaſe haulm, to be taken off in mild ſeaſons.

Theſe planting of beans may be repeated once in three weeks, and the leſs care is neceſſary as they come later, and the leſs ſeed. The ſetting them at greater diſtance will do as they are ſet later. The Windſor beans may be ſet in rows at a yard diſtance, and at three inches in the rows.

The after crops ſhould be planted about a fortnight after each other, from February to the middle of May, kept clear from weeds; and when they are in bloſſom cut off the tops of all. The later the beans are ſown, the moiſter ground they require.

Of the ſeed, ſowing, and ſteeping.

Care muſt be taken in the choice of ſeeds, particularly when brought from diſtant places, or when had from ſtrangers; ſince the crop muſt miſcarry if the ſeed be bad; and where it is but indifferent, the greater quantity muſt be uſed to anſwer for accidents.

There are four ways of ſowing, or planting beans.

The old way in the field was generally to plow the ground, and let it lie ſome time: then to ſow them in the broad caſtway, and harrow them in. This was ſeldom found to anſwer well; the ſeed being too much expoſed to be eaten by birds, or burnt up in ſummer, for want of a proper depth.

Of late they generally ſowed beans under furrows, plowing them in with as thin a caſt as poſſible; and, in very ſtiff lands, they harrow the ground after a ſhower, when the beans begin to peep, which helps to break the clods, and let out the tops. Care ſhould be taken not to plow too deep, for fear of burying the ſeed, and to lay the turf flat, not edge-ways, that the beams may be covered with mould; ſince if they lie hollow, they will be ſubject to decay.

The ſecond way is by the drill plow; but a ſtiff ſoil, and the make of the beam does not ſuit it well.

The third method is ſetting the beans by hand, in rows, at three inches diſtance, when the ground is properly prepared: which the women will do in many places for threepence the peck. This is a moderate expence; and will be ſaved in the ſeed beans uſed this way. But in this way I ſhould prefer the making the holes with a trowel, rather than a dibber; which, though it gives a little more trouble, it prevents the beans from lying hollow; and leaves the mould looſer about them. It comes neareſt the ſowing in drills made by the hand hoe, or by the common plow; which may be reckoned the fourth and laſt way: both theſe are uſed by gardeners; who are expert at the hand hoe, and will diſpatch a great deal in a ſhort time, and plant the rows at any deſired diſtances, either to have the interſtices left open for other crops to grow betwixt them, or for the beans to ſpread.

This method of planting the beans, ſeems to have every advantage that can be obtained, both in reſpect of the depth and diſtance; and alſo in regard to their being incloſed by mellow ſoil, into which they may freely ſtrike every way.

The common plow may anſwer moſt of the ends laſt mentioned, and is much uſed for thoſe purpoſes; and, I preſume, the method of ſowing by the hand along with the plow, may be equally uſeful in beans. Gardeners are ſaid to love the plow in this, as well as ſome other caſes.

Steeping of beans is not common for thoſe ſowed in the field, the ſeaſon being uſually wet, and conſequently there being no occaſion for it, on account of their being made to vegetate; but the bean will bear ſteeping very well, and thoſe planted in gardens late, frequently are ſteeped with very good ſucceſs.

I have frequently ſteeped Windſor beans in milk, in milk and water, in the water coming from a dunghil; and in water in which ſheeps dung was diſſolved, and in theſe ſeveral liquids, varied different ways; ſteeping from twelve, four and twenty hours, and longer, and I found they anſwered very well, I do not remember that any of them miſcarried, and theſe are things eaſy to be met with, and what may be uſefully applied in almoſt any quantity.

The uſual quantity of ſeed for an acre is about three buſhels in the common way, which is now found more than neceſſary; ſince experience ſhews, that when they have more room, they bear better. They ſhould never be ſet in rows leſs than a foot diſtant; and if wider the better, and not cloſer in the rows than three inches. The farmer may proportion his diſtances accordingly in any manner of the planting them; as when the ground is plowed for them, by miſſing one or two furrows; for their being any way in rows gives him an opportunity of hoeing and earthing them up: ſowing any compoſt amongſt them, letting ſheep into them before they bloſſom, to top them if they run too much into ſtraw, or are infeſted with the pernicious dolphin fly, ſo frequently fatal to them, eſpecially when they grow cloſe, and in ſmall incloſures. Againſt this the topping the beans is very uſeful. Gardeners do this with ſheers, and they may be topt to about two foot high, or to three in the field, in the ſame manner, with no great pains, or with a ſhort ſcythe fixed in a proper ſtick with leſs labour.

The farmer muſt frequently change his ſeed; and not ſow beans in the ſame ground ſoon. The beſt method of changing is, by bringing ſeed from ſtiff land to that which is lighter, and from the lighter to the ſtiffer.

Of the ſoil; and preparing the ground for beans.

A ſtrong moiſt ſoil ſuits the bean beſt, and it proſpers better open than when confined in ſmall incloſures; where it is more ſubject to blight, and the fly: warm light land is by no means proper for beans.

Vales generally do beſt, the chiltern or up-lands being frequently too light and dry; eſpecially if a dry ſeaſon follow, or the ground be plowed oftener than neceſſary; by which it will be left hollow.

As to preparing the ground for beans, there are two things to be conſidered: when it is only juſt broke up for them; and when, according to the courſe of tillage, it is to be ſowed with them.

In the firſt caſe the ground is ſuppoſed to be in a proper condition for a good crop, and then ſuch a produce is expected. Alſo, that it ſhould be uſeful in making the land mellow for an after-crop of corn; and to keep down the weeds. We are told by a modern writer, that theſe ends, and much the greateſt produce will be obtained, if the drill and horſe plow be uſed to ſtir the ground betwixt the rows of beans.

How far the horſe plow will anſwer as to weeds, has been ſhewn before. But the ſtrong objection againſt it in this caſe is, that it turns the weeds towards the beans, and that it is then more trouble to get them out there, than the hoeing the whole with the hand hoe. I know an excellent farmer who choſe laſt year to lay out fifteen ſhillings an acre in hoeing his beans by the hand hoe, as the beſt way; not that he expected his beans to pay him, but in order to prepare his ground clean for a crop of wheat to follow. Beans being known not to impoveriſh the ground, but rather to improve it for wheat. This farmer was right where ground is freſh, and ſome prepared compoſt on it ſince broke up. The land is commonly plowed early in autumn, and they let it lie in ridges till Chriſtmas, by which it has the benefit of winter froſts and weather: after that it is then plowed in ſmaller furrows. Two plowings will make the ground fine enough till it is plowed and ſowed, when the furrows ſhould be made ſhallow.

If any improvement is proper during the time of their growth, a compoſt may be ſpread amongſt them, and will preſently incorporate with the ſoil, on the looſening it either by the horſe plow or hand hoe.

Sir Hugh Plat mentions the ſcattering two buſhels of ſalt amongſt the beans, at ſeveral times, and why may not ſea ſand be thrown amongſt them, or ſome ſea water conveyed amongſt them; theſe are known to fertilize ground, and deſtroy weeds and vermin. In Cheſhire I have known brine poured on pavements to deſtroy weeds; and I ordered a cart load of the ſweepings of a ſalt work to be ſpread on a parcel of rough ground, and it being laid thick on about two hundred ſquare yards, deſtroyed every vegetable on it, but would enrich the ground for the future, and it would, by degrees, become fruitful. Small trials are eaſily made.

Common ſalt weighs about fourteen pounds to a peck, the fourth part of a buſhel.

Of the produce and advantages of beans.

A reverend author reckons the common produce of beans to be twenty buſhels the acre, which allowing three for the ſeed is about ſeven for one; and adds, "that no grain yields "a greater increaſe than this, if it is rightly cultivated, "nor turns to greater profit." (p. 103.) He mentions one ſingle horſe bean producing ninety pods, containing two hundred and thirty-two beans, which the next year produced three gallons; the next year ſeven buſhels and a half; in fine, ſeventeen quarters and two buſhels in four years from one bean: but this does not equal the produce of corn.

A very ingenious writer mentions thirty buſhels as a produce of beans not uncommon from good vale lands, per acre, and there may be an increaſe of ten buſhels by the modern huſbandry.

Taking the produce at thirty buſhels as a medium, and deducting the ſeed, there will be twenty-ſeven buſhels clear, which, at two ſhillings per buſhel, will amount to two pounds fourteen ſhillings.

Out of which deducting rent eight ſhillings.

Three plowings, twelve ſhillings.

Harrowing, hoeing, and weeding, eight ſhillings.

Reaping, loading, and threſhing, ſix ſhillings, the whole outgoings are one pound twelve ſhillings; which being deducted from two pounds fourteen ſhillings, the produce is one pound two ſhillings.

What is this, compared with the profit of a middling crop of wheat or oats.

We ſhould not do juſtice to this ſpecies, ſhould we omit any advantages it is uſually attended with.

Beſides the profit, it gives the farmer an opportunity of changing his grain, and ſo far occaſioning the production of better crops of wheat, barley, oats, and clover, in their ſucceſſive turns: it being undoubtedly true, that the longer any grain is deferred before it is ſowed again on the ſame ground, the better the crop may reaſonably be expected.

Another advantage of beans is, that they give an opportunity of planting other roots betwixt the rows, which will not hinder the growth of the beans, and may bring in a conſiderable profit. Whoever looks into a good gardener's ground, will ſoon ſee ſuch varieties of this kind, as to give him ſufficient choice of this ſort. And great variety of vegetables, as carrots, turnips, lettuce, and many more of the ſame nature, may be ſowed or ſet in the interſtices.

Peaſe have frequently been ſown, and are thought to do tolerably with beans, and it is ſaid may be advantageouſly ſupported by the beans; but wherever they claſp the beans, there can be no expectation of any pods as far as the pea reaches. Peaſe may be ſowed betwixt them, when the beans are ſet in rows two foot aſunder.

Turnips ſowed betwixt the beans would anſwer well, both as a crop and for keeping down weeds.

When the ground is hoed, the turnips might be ſowed with very little trouble, there would want nothing but a raking, to cover them a little.

If ſome turnips were tranſplanted, and ſet at a foot diſtance betwixt the rows, they would do well.

The drill method of ſowing is thought not to ſuit beans very well, on account of their ſhape, which is an obſtacle to their falling regularly in the rows, and they requiring a ſtiff land: this method of huſbandry does not well ſuit that ſort of ground.

Of reaping beans.

Beans are reaped with hooks as peaſe are, or ſhorn: in both ways they are bound up in ſheaves, and ſet on an end together.

They are commonly bound with ſtraw bands, but the better farmers buy a coarſe ſort of hemp twine, and cutting it into proper lengths, bind up with them; by allowing three inches more than neceſſary the firſt year, for the loſs of cutting them open when laid on the floor for threſhing, theſe bands will ſerve two years very well.

Beans are frequently malted, and mixed with other malt for brewing of ale.

Of keeping beans.

Beans will keep in ſacks for a conſiderable time, or in a ſtack in their ſtraw: and ſome keep them in hair bags, to ſecure them againſt vermin.

There is a cuſtom in Eſſex, of putting four buſhels in a ſack. But to facilitate the removal of large ſacks of thoſe, or corn in their granaries, and other places, they have a machine.

A machine to wheel ſacks in granaries, corn chambers, &c.

It goes on two wooden wheels, the diameter of which is five inches, pegged on the outſide through the end of the axletree, which is eighteen inches long, and where ſquare an inch and an half, and is faſtened in the ſtilts, which are there a foot aſunder, and the other is round for the wheels to run on.

The ſtilts are like thoſe of a common plow, three foot ſix inches long, and kept aſunder and firm by a flat let thorough them at two foot high, where the ſtilts are fourteen inches wide betwixt them, and two inches and an half on the ſide, and an inch and an half front: they grow narrower in the ſubſtance, but wider betwixt them to about ſeven inches, and then are rounded and bend backward to handle them by.

At the bottom a board four inches and an half broad, and an inch and half thick, is let a little into the axle tree and ſtilts, and ſloped downward: the under out edge of this is taken a little off, ſo that it falls near level with the bottom of the wheels, and the machine ſtands upright when ſet on the level, but is bent backward by the handle when the ſack is on it, and the ſack will reſt on it as it ſtands.

An iron plate an inch and an half broad, is nailed ſix inches on the bottom of each ſtilt, and along the axle-tree, and two inches over the bottom board, to ſtrengthen it.

Croſs the outſide of the bottom board a rib is nailed, an inch and an half at each end: it goes even ſo far, but the middle riſes gradually each way to a thin edge, which, on bending the ſtilts forward, goes under the bottom of the bag, and when the top is pulled on it to the ſtilts, and this keeps the ſack from ſlipping off.

The ſubſtance of the weight reſts on the wheels, and is eaſily turned any way by the ſtilts or hands.

Moſt people know the weight a perſon may draw or wheel with eaſe, in compariſon of what they can carry; and the common waggoners draw three ton with five horſes, when twelve hundred would be a ſufficient load for them.

And why may not a board be fixed to it at the croſs bar, and be opened when wanted, and ſet on the foot board by an iron, to drop down and hold it, as is often done in ſeats: on this almoſt any thing might be carried from place to place, or the wheel might be made deeper, if neceſſary, or a pair of larger wheels occaſionally be put on the ſame axle-tree.

Of Peaſe.

The pea appears under ſo many forms, there is need to explain them; diſtinguiſhing which belong to the farmer, and which to the garden. About great towns, particularly London, the farmer ſows ſome kinds of the garden pea, and the gardener makes his plantation in the fields, ſo that they intrench upon one anothers province. There are therefore ſome kinds of peaſe common between them; others peculiar to the farmer; and another claſs, that the gardener is alone concerned withal.

The pea is a climbing plant, with ſlender branches, and numerous leaves, with claſpers or tendrills, by means of which it lays hold of what ſtands near. The flowers are papilionaceous, and are ſucceeded by pods, in which are contained the peas.

The flower of the pea ſtands in a little green cup, form'd of one leaf, divided into five parts.

It is compoſed of four leaves, one upright and broad, two ſtand ſide ways, and are ſhort and roundiſh; the fourth ſtands at the bottom, and is ſhort and compreſſed.

Within this flower ſtand ten filaments, nine are ſhort, and grow together; and one is longer, and ſtands ſeparate.

Among them riſes the rudiment of the pod: this is ſmall and flatted; and there riſes from it a membraneous thread, to the ſide of which near the top, grows a little head pierc'd for the reception of the duſt, from the round heads of the filaments.

This duſt impregnates the ſeeds, and when the flower is fallen they ſwell, and the rudiment forms the pod. There are four ſpecies, which, from their general form and manner of growing, are plainly diſtinct kinds, owing to nature, not to art.

1. The garden pea, which may be called the white pea.
2. The field pea.
3. The ſea pea.
4. The ſimple leafed pea.

The garden pea has winged leaves, and ſeveral flowers upon one foot-ſtalk. The field pea has but one flower upon each foot-ſtalk. The ſea pea has an angular ſtem, and ſeveral flowers upon each foot ſtalk. And the fourth has ſimple or ſingle leaves.

Winged leaves are compoſed of ſeveral pairs of others. The firſt of theſe is the pea we cultivate in gardens, the ſecond is that ſown in fields: and under each of theſe really diſtinct ſpecies, there are many leſſer varieties: the ſea pea is wild in England, it grows on the ſea coaſts, in barren naked clifts of rocks, and among pebbles, where no earth is ſeen to give it nouriſhment. The fourth is a native of the Greek iſlands.

In a time of great ſcarcity, the people about our coaſt found the ſea pea in great plenty, and fed upon it. Till neceſſity had ſent them to its ſtores, they never had obſerved it, and they then thought it ſent by miracle to their relief.

The reaſon of its thriving where no earth appears is, that it ſends the roots to a great depth. The produce of it is very great in its wild ſtate, as appears by the numbers who were in that calamitous time ſupported by it; and there are reaſons enough to try how it would anſwer by culture.

There are many acres of waſte ſea beach, on which nothing uſeful grows; it would be worth while to try this native pea upon them.

We ſee it will ſerve for food to ourſelves, but if only for cattle, it would ſtill be worth raiſing.

Of garden peaſe.

Gardeners raiſe a variety of auriculas, tulips, and carnations from a few original kinds, and ſo it is in the peaſe. Good ground, and careful management, go a great way; and the mixture of the duſt from the buttons in one ſpecies with that of another, or to impregnate the ſeed does the reſt.

If we were writing to the gardener, we ſhould enter at large upon this head: but as the huſbandman has leſs concern with it, we ſhall treat it more lightly; not omitting it, as he may in particular ſituations find it profitable to fall into the practice. The three moſt diſtinct varieties, are, firſt, the great or rouncival pea; ſecondly, the ſquare pea; and thirdly, the umbellated pea; the gardeners enter into a longer detail. Their principal kinds are,

1. The early pea, called the hotſpur.

2. The dwarf pea, a low kind, the ſtalk much firmer than the common one.

3. The french dwarf; leſs ſturdy than ours, but the pea is more delicate.

4. The ſoft ſhelled pea; this has a huſk ſo tender and ſweet, that it is eaten in the manner of the french bean.

5. The large pea, called the maple rouncival. This has a beautiful red flower, and the pea, when ripe, is variegated with ſeveral colours. It is ſometimes ſown in fields.

6. The crown pea, the umbellated pea before named, but the gardeners raiſe a ſmaller kind than that deſcribed by authors.

7. The ſpaniſh marotto, of the rouncival kind, very large, and diſtinguiſhed in the dry ſeed by a black line.

8. The marrowfat is diſtinguiſhed by the breadth of the pod, and the ſoftneſs and ſweetneſs of the pea.

9. The union. This is one of the rouncivals, well taſted, but very large.

10. The flat rouncival is a great rarity in ſome of our curious gardens; a middle pea between the rouncival and marrowfat.

Theſe are the moſt diſtinct kinds. The four principal he ſhould meddle with, if with any, are the common white, the hotſpur, the rouncival, and the marrowfat.

Of the culture of the garden peaſe.

Early peaſe are raiſed about London, by the aſſiſtance of walls and hot beds. They are to be ſown under a warm wall, in October. The earth is to be drawn up about the plants as they riſe, for by this means they will be ſecured againſt the froſts; and having been kept alive till the beginning of February, they are to be removed to hot beds, where they muſt be planted at two inches diſtance, in rows a foot aſunder.

The french dwarf is a good kind for this. The next are the hotſpurs.

This muſt be ſown in a rich ſoil, and warm ſpot, in the end of October; that called the maſter's hotſpur, is the earlieſt and beſt.

As theſe riſe in height, the earth muſt be drawn up about their ſtems; and if froſts are ſevere, ſome old pea ſtalks muſt be thrown over them.

In ſpring they muſt be weeded, and kept clear of ſlugs. A little lime will deſtroy them. Thus managed, the peaſe will bring an early, and large crop. The ſpaniſh marotto is to be ſown in February; and in the beginning of March the common rouncival.

Keep them clear from weeds, and be cautious not to tear the ſtem in gathering.

According to their ſize they muſt be ſown at different diſtances: the largeſt peaſe the farther aſunder.

Of field peaſe.

The field pea is divided into many kinds.

1. The white pea. This comes the neareſt to the common pea of the garden; and its principal difference is, that it is ſmaller.

2. The grey pea. This is a large and very uſeful kind.

3. The blue field pea, called in many places the hog and pig pea.

There are as many varieties of each of theſe as of the garden kind, and named from places where they have been raiſed, and other trivial accidents; but we ſhall cut off a great deal of perplexity, by telling him, all that vaſt variety are to be reduced to theſe three principal kinds; and that theſe being very diſtinct in themſelves, and ſtrongly marked by their different colour, he will find it eaſy to diſtinguiſh them ſeverally from each other, and know to which of theſe he is to refer any of the reſt.

The white, the grey, and blue pea, are diſtinct, and require a ſeparate management; but that which is proper for one white pea is proper for all white ones, and ſo of the others.

The white requires one kind of ſoil, the grey another, and the blue ſucceeds beſt in a third; but all white peaſe require the ſame ſoil with the common white; all greys the ſame with the common grey; and all blue the ſame with the common blue.

Of the proper ſoils for the three kinds of field peaſe.

Peaſe are a very uſeful crop on many occaſions: when the farmer is about to raiſe them, let him examine the nature of his land, and ſuit the kind to it.

The white pea being of the nature of the garden kind, ſucceeds beſt upon that land which is moſt like garden ground: let this kind be ſown in a field, the ſoil of which is fine and rich. A deep mellow earth, or a rich loam that is not too ſandy, are the two kinds that ſuit beſt with this ſpecies.

The grey pea is hardy, and loves moiſture; for this reaſon a clayey ſoil ſuits beſt with it.

The blue pea is hardy like the grey, but nothing hurts it more than cold and wet, therefore its proper ſoil is the light, ſandy and dry.

All white peaſe love a mellow earth; all grey peaſe, a clayey; and all blue peaſe a ſandy: and as there are certain ſoils that ſuit them, ſo there are alſo diſtinct kinds of manures, which beſt agree with them.

Dung is the manure that beſt agrees with the white pea; nothing enriches the ground for the blue pea like lime. As we have mentioned a clayey ſoil for the grey pea, ſome may be ſurprized at our naming marle as the manure in which it moſt delights; but we have ſhewn that the proverbial ſaying againſt marling of clay, is not ſo univerſal as has been imagined.

Any ſoil in which there is clay, will ſupport the grey pea profitably; and marle will enrich it excellently for this purpoſe, at the ſame time that the pea itſelf improves it for corn.

This is an article of great conſideration. The pea not only yields a good crop in itſelf, but ſerves the huſbandman in deſtroying weeds; it improves the land on which it has grown, and excellently prepares it for other crops.

This article of the particular ſoil ſuited to each kind of pea, has not been hitherto ſufficiently conſidered; and the farmer therefore is not acquainted with the great advantage of this pulſe.

He finds it ſerve in the ſucceſſion of his various crops; and when chance directs him to ſow the right pea upon the right ſoil, he ſees the advantage in its full light. Theſe are called favourable years, and the expectation of them keeps up his ſpirits; but what he attributes to ſome unknown cauſe, may be the effect of his own care and application; and what he thus finds from chance now and then, he may at all times command from proper management.

The grey pea will yield its full produce in thoſe ſtiff ſoils, which ſo well agree with its nature, without the frequent fallowings; ſerving in the place of a fallow, while it is yielding all the time ſo profitable a crop: and ſo it is in each of the others, only obſerving this proper management.

In reſpect of manures, peaſe will always anſwer to the expence of them; and the profit is not to be expected wholly from theſe, for they exhauſt the land ſo little, it is not the leſs fit for a ſucceeding crop.

Peaſe ripen earlier in land that is leſs manured; but the richer it is made, the greater is their produce.

Wheat, the richeſt and moſt profitable of all grain, follows peaſe excellently; and the ſeaſon of ſowing the wheat comes ſo naturally after that of gathering the peaſe, that it ſeems as if they were deſigned to come after one another.

As ſoon as the peaſe are cut, the land ſhould be plowed acroſs; after this it ſhould be harrowed, and then plowing it again in the beginning of October the wheat is to be ſown.

Of the ſowing of peaſe.

Two articles are to be conſidered under this head; the quantity of ſeed peaſe proportioned to the ground, and the manner of placing them in it.

The larger the ſort of pea, the greater ſhould be the diſtance of the plants. And upon this depends the firſt article of their management.

Good ground will enlarge a poor pea, and a ſtarving ſoil will reduce one that is naturally large; but we can here ſpeak with ſufficient certainty, knowing what is the condition of the three ſorts into which we have divided field peaſe in ground equally favourable.

The grey pea is naturally the largeſt plant, the white the next in ſize, and the blue the leaſt.

A good ſoil may enlarge the ſmaller kinds, perhaps ſo as to equal theſe naturally larger, on a poor one; but there is alſo a difference in the ſize of the plants among thoſe different varieties we have named, of theſe ſeveral general ſpecies. All this is to be conſidered as the occaſion of accidental variations; but, in general, the rule is what we have here laid down; and, conſequently, the greateſt number of peaſe is to be allowed to the acre in the blue, and the leaſt in the grey kinds; the white being kept as a medium.

We ſay number in this place, becauſe the meaſures may deceive: the grey pea being larger, conſequently fewer fill the buſhel. This makes a certain difference, but not ſo much as is neceſſary in the management of the plants as to diſtance in the field. The farmers know this, and proportion their meaſures accordingly; but though they are right in the thing itſelf, they fail in the degree, for they allow too large a proportion of the great kind.

The allowance in the common way of huſbandry, in thoſe counties where the culture of peaſe is beſt underſtood, is two buſhels of the grey to an acre: they allow three buſhels to an acre in the white peaſe, and four in the blue. But all this is too large: nothing ſucceeds ſo ill in a promiſcuous and irregular ſowing as the pea; and when they are planted regularly, there may be an abſolute certainty as to the quantity and diſtance. The time of ſowing peaſe differs alſo according to the kinds; though this rather reſpects the ſoil to which they are ſuited, than any thing in the pea itſelf.

The grey pea is to be ſown in February, becauſe growing in a cold ſtiff ſoil, it makes at firſt but a poor progreſs. The time for the white pea is the beginning of April; and the blue may be ſown a fortnight later than this: the middle of April is the beſt general time.

The huſbandman who recollects what we have ſaid on the nature of ſoils, will eaſily conceive what we mean by this: ſandy ſoils make a quick ſhoot in what is ſown upon them, and therefore this late time is very proper, for they have ſtill enough of the ſeaſon for their growth. The white pea has a ſoil of a middle nature between theſe, and therefore it is to be ſown at a middle time.

We now come to the manner of ſowing them.

The white pea is uſually ſown with a broadcaſt, and harrowed in. This is that promiſcuous and uncertain method we have before mentioned, as ſo improper for peaſe of any kind.

The uſual method is to ſow the grey pea under a furrow; and this is ſo hardy a kind, that it may be put into the ground any time during the latter part of the winter.

The blue pea is ſown as the white, only thicker, and is harrowed in after the ſame manner.

This is the way in many places, but it is the worſt of all. The firſt improvement for the planting of peaſe was the Suffolk Dibble, ſo call'd from its place of invention or original uſe. This is a kind of iron rake with the tines ſet parallel to the handle. The handle is of the ſame form as in the garden rake, the croſs piece is thicker, and there are four, five, or ſix large iron ſpikes let through it. The way of uſing it is this, a man goes over the field with the dibble, and women follow him with peaſe in their aprons. He ſtrikes it into the ground, preſſing down the tines with his foot upon the back of the croſs piece. Thus four, five, or more holes are made, into which the women drop their peaſe, one into each, and leave them open. This done, the whole field is lightly harrowed over, and all are covered together.

The perſon who ſtrikes the dibble, generally goes over the field backward and forward in rows, or lines, a foot aſunder, but 'tis done at random, and the peaſe grow in a ſlovenly and irregular manner.

This method is expeditious, and diſpoſes the peaſe with a degree of regularity; it is therefore preferable to the random method of ſowing them by hand; but it is capable of eaſy, and great improvement.

The farmer who intends to ſet his peaſe by the dibble, ſhould have three kinds of inſtruments made according to the difference of his peaſe, and the diſtance they require in growing; one for grey peaſe with the tines five inches diſtance, another for white with them at four, and another for blue at three inches. The tines ſhould be longer for the grey than for the others, and ſhorteſt of all for the blue; becauſe experience ſhews, that the ſeed of the grey will bear deeper covering in the ground; and this is an eſſential article;

ticle; the ſeeds of no crop whatſoever being more in danger from mice, birds, and vermin.

When the farmer has provided himſelf with proper inſtruments, I would have him order the dibbler to go over the ground with regularity, drawing a gardener's line acroſs, and working cloſe to it. This would ſet the rows exactly ſtrait, and would make the work eaſier and leſs hazardous to the hoers.

The rows might thus be eaſily planted at an exactly proper diſtance, and that proportion'd to the kind in each. The grey pea rows ſhould be two foot aſunder; the white a foot and half, and the blue little more than a foot.

Thus would the field be planted with regularity, and the hoeing and reaping would be done the more eaſily. There would be a little more expence, but very little in the firſt operation; but this would be ſaved in the two others.

We have named here what may be called a middle diſtance for the ſeveral ſpecies: a finer or coarſer ſoil, a richer or poorer ground make ſome difference in what is to be done in this reſpect. The farmer having here the medium, will eaſily make the proper variations.

In ſome places they follow the garden practice in the field, opening trenches by line, and covering the peaſe, when in the ground, with hoes. This is better than the method by the dibble, in that it leaves the earth more looſe all about them; but it is more expenſive, and the other ſucceeds very well.

Having named what are the ſeveral manners of ſowing or ſetting of peaſe in the practice of the common huſbandry, it is time to ſpeak of what may may be done in this article by the drill plow, and the horſe hoe, its happy and proper attendant.

We have ſhewn how other crops are capable of being improved by this practice, but there is none that can be ſo greatly aſſiſted by it as the pea of every kind; nor any to which it is ſo happily ſuited.

We have ſhewn the advantage there is in ſetting the peaſe in rows by the dibble, and mentioned wherein the garden method of the trench and hoe is ſuperior to this; but the drill plow anſwers both purpoſes together; it does better than either, and the expence is leſs.

We adviſe the farmer to uſe this method preferably to any other, and ſhall give him all the needful directions in a few words. Having explained at large the general method of drilling, and the ſtructure of its inſtruments, little is needful to be ſaid in ſuiting it to the particular circumſtances of any crop.

Let him ſee his inſtrument be properly made, and let him go over the field ſowing his peaſe in double rows, with one foot partitions, and with four foot interval between every two pair of rows.

The peaſe will thus be let in regularly: the earth will lie looſe about them, they will ſhoot freely, and they will be diſpoſed in the moſt happy manner for weeding and reaping.

Of weeding the pea field.

When peaſe are ſown in the random way, hoers are to be ſent into the field when the crop is up, not only to cut up the weeds, but to thin the peaſe where they ſtand too thick, which they always do in ſome places.

Peaſe are round and ſmooth, therefore they will roll about eaſier than any other ſeed. We have ſhewn how apt corn is, when ſown in the common way, to run in heaps in the holes, and leave other parts of the field deſtitute; but this is much more the caſe in the peaſe, becauſe of their figure; and hence it is that of all ſeeds ſown promiſcuouſly they are the moſt apt to riſe in cluſters. Hoeing them thinner is the more needful, becauſe in no caſe the plants more hurt one another.

The farmer muſt be careful in his inſtructions; and keep his eye now and then upon the people, otherwiſe he will have a poor crop.

When the peaſe are ſet by the dibble, made according to our directions, the hoer's buſineſs is reduced to the one point of cutting up the weeds: and it is eaſily done, becauſe he is to work in regular ſpaces.

In the other way, by the trench hoe there will be the ſame advantage of a clear ſpace to work in; but as the ſeeds have been there ſcattered a little at random, the hoers muſt be ordered alſo to thin them in the rows where they meet with places, in which they ſtand too thick.

Theſe are the methods in the common ways of planting, and the advantage of the hoeing is not confined to the preſent crop; for deſtroying the weeds, it prepares the land for that which is to follow.

In the method we have propoſed of ſowing by the drill, the horſe hoe, as well as the hand hoe, is to be employed,

ployed; and the effect of this upon the preſent crop is prodigious, while at the ſame time it acts as a thorough fallowing of the land for that which is to come afterwards.

We have ſhewn to what a depth the root of the ſea pea will penetrate the earth for nouriſhment: all peaſe are enclined to the ſame particularity; and as few plants with fibrous roots penetrate deeper, none whatever ſpreads farther under the ſurface at the ſame time.

This may ſhew as the reaſon, that there is no crop which receives ſuch great, palpable and evident advantages from horſehoeing.

We ſee how deep the earth may be mowed advantageouſly for peaſe, and there is no way of doing this but by that excellent implement the hoe plow: as the advantage, in this reſpect, is much leſs from handhoeing, which only breaks the ſurface, ſo it is in reſpect of the improving the ground for future crops.

When the drill plow has been employed in ſetting the peaſe in double rows, and with the large intervals we have directed, the horſe hoe muſt come in to clear thoſe intervals, nouriſh the crop, and fallow the ground; while at the ſame time the hand hoe is neceſſary among the plants. This need be uſed but once, the other muſt be repeated occaſionally, and the manner of uſing both is this.

When the peaſe are four inches high, the hand hoers are to be ſent in, but as they have only a very ſmall part of the ground to work upon, a few of them will do for a large field; and a little time will be ſufficient.

The peaſe will ſtand according to this method of ſowing in double rows, with a ſmall ſpace between row and row, and a great interval between one pair of rows and another: and the whole ground between and about them, will be well covered with a young crop of weeds.

The partitions between one row and another, in each pair, are the part where the hand hoers are to be employed; the larger intervals are to be left for the horſe hoe.

In handhoeing theſe ſpaces muſt be cleared of weeds, and that being once done, is not to be repeated: for the young crop being thus got down, will never be ſucceeded by another in that place. The rows at this time appear diſtinct; and there is room for the growth of weeds between; but ſoon after the peaſe grow to a height, and meet one another, ſo that no weed can grow among them.

The handhoeing being over, the ground is to be left to itſelf ſome time. The moving and breaking the mould juſt about the roots of the young crop, on one ſide, will do them great ſervice, as they now are young, and ſpread principally at a very little depth: afterwards they will require a ſupply at their greater depth, and that will be given them by the horſe hoe, though it could not by any other means whatever. This is what they extreamly want, and this is the reaſon of that vaſt fertility which will follow the uſe of that inſtrument.

When the weeds are grown to ſome height, the horſe hoe is to be ſent into the field: it muſt be carried ſtrait up in the midſt of every interval; and it muſt be ſet to cut deep.

This will tear up great part of the weeds, and bury the reſt, and will not ſhake the plants.

The farmer may now ſend in his hand hoers again, to cut up the weeds cloſe on the outſide of every row.

This is not altogether neceſſary, but it is uſeful; and will very well pay the little charge it coſts.

While this ſecond handhoeing breaks off the ends of the ſhort and ſlight roots within its reach, the deep furrow in the centre of the interval cuts off the ends of all thoſe longer and more ſerviceable ones which had penetrated ſo far, and ſpread ſo wide, as ſome at this period of the peaſe's growth will always have done; and from the broken ends of theſe there will be innumerable others immediately formed, ready to draw nouriſhment; and they will have a freſh broken earth eaſily to ſpread in, and full of that nouriſhment for them.

As to the repetition of this horſehoeing, the farmer may be left to his diſcretion. If he do no more he will be ſure of a great crop, for this new broken ground will ſupply the roots with a great quantity of nouriſhment all the time the peaſe are to be upon the ground: but if he chuſe to repeat it twice more, the advantage will be proportioned, and he will be ſure of finding a manifold return for the expence.

If he will give his crop three horſehoeings, they are to be conducted in this manner.

The firſt muſt be a few days after the handhoeing of the partitions; and the two others at equally diſtant times between that and the beginning to pod.

The firſt is to be performed very deep, and in the middle of the large interval; and the two following muſt be more ſhallow, and be carried in the middle way between the firſt furrow and the rows.

Few will be at the expence of repeated horſehoeings on a piece of peaſe, without ſeeing the advantage thoroughly explained, but that is in itſelf ſo clear and evident, when the whole compaſs of the work is taken in, and the benefit to the crop conſidered, that we ſhall be able to ſhew every thinking huſbandman it is to his real and great profit.

Two points are intended by the ſowing of peaſe; the one to get a profitable crop; the other to prepare the land for corn. Both will be anſwered by this method. His crop will have the advantage of ſo much nouriſhment, as could not be given to it any other way; the produce will be great accordingly; and at the ſame time the land will be prepared for wheat by ſuch repeated plowings ſo finely, that there is no method whatſoever of making it ſo rich, or dreſſing it ſo well for that grain.

Reaping of peaſe.

Peaſe being come to their growth, are to be watched for the time of gathering. For it is of importance that the due ripeneſs be obſerved. In the plantation of garden peaſe in the field, the common method of pulling them as they ripen is to be followed; but in the farmer's concern, where they are not of that kind, nor intended for that uſe, they muſt be reaped at once.

In gathering by hand women are to be employed: they are to be ſent into the field daily, to gather as the pods ſucceſſively ripen, ſo that the profit riſes daily; and it is to be begun as ſoon as any are fit to pull, and continued as long as there are any in a condition for ſervice. For this there needs no particular farther direction.

In the farmer's pea field let all care be taken in examining the peaſe, from the time the pods begin to ſwell. From this period till their ripening, which is known by the ſize and firmneſs of the pea, the owner himſelf ſhould every day go into ſeveral parts of the field, and open pods in different places.

All will not ripen together upon any ground, but he will thus know when moſt are ripe.

He will loſe ſome by ſheding, and ſome will be unripe at whatever time he reaps them, but he is to contrive ſo as to loſe the leaſt he can by one or other of theſe accidents. It is better to err on the ſide of their being under ripe than the other; becauſe thoſe which are but moderately ripened, will harden in drying; whereas, when the field in general is too ripe, a great deal will be loſt by ſhedding.

The beſt method of reaping is by a hook with a good edge, faſtened to a long handle. A dextrous fellow will do a great deal of buſineſs in a day with this inſtrument, in a field of peaſe ſown in the common manner; but in one planted regularly, the ſame hand will go through ſuch a quantity as is ſurpriſing.

When the peaſe are cut down, leave them to dry a little upon the ground; but when they lie in a ſcattered manner there is more harm than good done by this.

The reaper ſhould throw them up in ſmall heaps, as he cuts them.

Nothing is ſo eaſy as toſſing them on an heap, as they are cut with the long hook; and this ſhould be done in ſo careful a manner, that the heap may lie hollow and light: this gives the wind free play among them; and if rain happens, they are in the leſs danger of being ſpoiled.

When they have lain till the ſtalks and pods are dried, they are to be carried in, and that ſhould be done with care and diſcretion, that too much be not loſt in the ſhaking.

Of Tares.

The tare is a low climbing or drooping plant, reſembling the pea in growth, but ſmaller. The ſtalks are weak, and lean on the ground. The leaves are compoſed of ſeveral pairs of ſmaller, of a pale green colour, and there are tendrils for climbing or hanging upon any thing. The flower reſembles that of the pea, but is ſmaller, and of a mixed purple colour in the common kinds, tho' of various hues, in others. The ſeeds are contained in ſlender pods, and are round and ſmall. Their colour varies like that of the flowers.

There are two kinds of tares, the white and the black. Theſe are named from the colour of the ſeeds, and have little other difference: they are only ſeminal varieties: the white tares riſing originally from the ſeed of the black, as the common blue and red flowers of many kinds in our gardens, will occaſionally yield ſuch as are white. In the ſame manner the firſt variation in this kind of tare is, that the flower is white, whereas it is purple in the other; and the ſeeds afterwards are of the ſame white colour.

Either of theſe may be ſown in fields, but the common or black tare is the hardier kind, and the beſt bearer.

There may be a great advantage in ſowing tares, among the variety of articles with which the preſent practice of huſbandry gives the farmer an opportunity of varying his crops. They excellently prepare the land for corn, and their produce is of a certain and not inconſiderable price, being the food of pigeons, and uſeful to many other purpoſes.

We have ſhewn the profits of a dove-cote: wherever there are pigeons, there muſt be tares raiſed or bought; and this is not their only uſe: the ſtraw, when well dried, is an excellent food for cattle. So that upon the whole, the tare, though greatly inferior to many of the preceding articles, yet is a profitable, and very uſeful crop.

Of the ſoils for tares, and the management of the ground.

If the tare required a very rich ſoil, or great preparation, it would not be worth his while to raiſe it; but this is not the caſe: a very poor land will ſupport it; and it demands little preparation.

It is a hardy product, approaching to the nature of a weed; and will therefore grow either on land naturally poor, or ſuch as is exhauſted: this is what makes the farmer find his principal advantage in its culture: for it not only thus ſtands in the place of barrenneſs, but prepares the ground for better crops.

Although moſt ſoils will do for the tare, yet there are ſome that it affects more than others. The variety of articles of late years introduced into the farmers profeſſion, give him an opportunity of often varying the crop; and among theſe inferior kinds, he will find a double advantage in a prudent choice, which is moſt ſhewn in ſuiting the ſpecies to the ſoil.

The moſt favourable land for tares is a good ſandy loam. They will ſucceed excellently on mellow earth, if not too moiſt for them: they will grow very well on ſandy ground, that is not rich in any reſpect; and we ſee great crops of them in the lime-ſtone countries, and that frequently where there is very little depth of ſoil.

The worſt ground for the tare is a tough wet clayey ſoil. In Hertfordſhire, where a great quantity are raiſed, they find them always ſucceed better on the hilly grounds than in the vales.

The ſoil being fixed upon, there requires little care in making it ready for the ſeed. We do not mean to tye the farmer down ſo ſtrictly, as that nothing will do but ſuch a field as we have deſcribed, but when it happens he has the choice of two or three, and one of them anſwers this character better than another, he ſhould take the beſt.

We will ſuppoſe the field where they are to ſtand, has been exhauſted by the laſt crop of corn. In this caſe no preparation by manure, or repeated tillage is wanted: all that is needful is to plow in the ſtubble; and let this lie to rot; and in ſpring to open the ground for the tares; theſe crops are ſo far from demanding manure, that they ſerve as manure to the land themſelves; and of them all none more than this ſpecies.

Of the ſowing tares.

When the land is ready, the next thing is to take care of the ſeed: in this the huſbandman ſhould not be negligent: the care coſts nothing, and it enſures a profitable crop.

Let the ſeed tares be purchaſed from ſome farmer, at ten or twelve miles diſtant. The advantage of this, in all ſeeds, has been ſhewn already; and let the farmer purchaſe ſuch as have grown on a different ſoil from his own.

If his field be mellow earth, let him chuſe the ſeed tares from a loamy or ſandy ſoil; and if his be ſandy, let him chuſe the ſeeds from one that is not.

Thoſe tares are beſt for ſowing that are of a middling ſize, round, full, and plump, of a ſmooth and bright ſurface, and heavy. Few ſeeds are ſo apt to ſpoil.

The tare does not grow well unleſs it have been full ripe when gathered; and if it have ſuffered wet in the keeping, it loſes a great deal of its vegetative power. Theſe are the two accidents to fear, and he will be guarded againſt them by the rules we have given for his choice. Such tares as have been gathered before ripe, never get that roundneſs, fullneſs, or weight we have recommended, and if they have been damp, they loſe their gloſſy ſurface, and do not recover it again.

The quantity is next to be conſidered; and in this the common practice comes nearer what is right, than in moſt other ſeeds. The general error is ſowing too much, and what miſtake there is, is on the ſame ſide here, but 'tis not great: five pecks are generally allowed to the acre, but a buſhel is fully ſufficient: three pecks will uſually do very well.

The beſt time for ſowing is in the middle of February. little trouble need be taken about them, for the moſt ſlight ſtirring of the ground is ſufficient; but of one thing the huſbandman muſt take eſpecial care; which is, the finiſhing what he undertakes in this way without delay. There muſt never be more ſown in a day than can be well covered before evening; for if they lie expoſed to the dews of the night, they contract a damp that decays a great part of them; and the reſt grow poorly.

In general, a ſomewhat poorer ſoil is better than a more rich land for tares. In the former they pod well; in the latter, they are to run into ſtalk and leaf with leſs bearing. There is alſo another misfortune attending the ſowing of tares on rich land, eſpecially if it be moiſt, which is, they are more apt to lie upon the ground becauſe of the weight of the ſtalk, and then they rot.

There is an old cuſtom among the farmers of Eſſex, of ſowing tares and horſe beans together: they thrive tolerably well this way, but they do better ſingly. There is no difficulty attending the reaping of them, for they may be very well cut together, when ripe, which will be about the ſame time; and the different ſizes of the bean and tare make them eaſily ſeparated in the barn by a riddle.

Of mowing and reaping of tares.

The crop being in the ground will require no farther care, for they ſhoot quickly, and grow vigorouſly, ſo that weeds do not thrive among them. There are two ſeaſons of cutting them, the one for the food of cattle, the other for ſeed. The firſt may be continued at different times for ſeveral weeks, and it is a wholſome and profitable food; the other is only to be done at one period, that is, when the tares are ripe in the pods; and for knowing this, the tare is to be watched as the pea.

The cutting them for fodder is often the moſt important ſervice they can be put to; as to the letting them ſtand for ripening, it is for ſeed, or for food for pigeons.

Tares will be fit to cut in May for foddering cattle in the rack; and upon occaſion, they may before that time ſerve for feeding freſh in the field.

The great advantage of theſe crops of ordinary pulſe is, that they cover and ſhade the ground. The tare being larger than ſome of the others, ſerves this purpoſe better than they, and its ſeeds being of uſe, is another advantage, becauſe it may be kept longer upon the ground. For this reaſon, though the farmer may occaſionally cut his tares green, I adviſe him when he would give the ground the greateſt advantage from them, to let the whole crop ſtand till ripe. In this caſe the entire field is covered for a very conſiderable time, there are no weeds ſuffered to grow in it, and the whole is mellow'd by lying under the ſtems and leaves of the tares, while their roots draw but little nouriſhment to impoveriſh it. The tares being then obſerved from time to time, as they ripen, are to be reaped when they are fulleſt in the pods; and then left to dry in the field in little heaps, before they are carried home, for getting out the ſeed.

Of preſerving of tares.

Tares are damaged by wet, growing mouldy, or muſty; and after this they never recover their right condition, look or value: there is another accident to which they are liable, that is, the being infected with worms, mites, and other little vermin. In this caſe the pulpy part is eaten, and they become light, duſty, imperfect, and of little value.

The preſervation of tares from both theſe accidents, depends on the drying of them; for, as it is damp that moulds them, the ſame makes way for thoſe little miſchievous vermin: they are always found in damp tares, but rarely in ſuch as have been properly dried.

We have directed their lying ſome days in the field, to dry. After this, when the tares are got out, they muſt be managed according to the weather.

If the air be warm and dry, ſpreading and turning them on a floor for ſome days, will anſwer the purpoſe; if otherwiſe, they ſhould be laid upon a kiln: but, in this caſe the heat muſt be very gentle, and well moderated, otherwiſe it may do more harm than the damp; deſtroying the vegetative power in the ſeed, and injuring it in its nouriſhing quality.

When the tares are properly ordered, they muſt be kep in a dry place, and properly ſecured from vermin. The thorough drying is very eſſential, for otherwiſe they will breed diſorders in the pigeons that are fed with them; and when uſed as ſeed, not one in ten will grow.

When they are to be kept any long time, the beſt way is to put them up in large barrels; then ſetting them in a dry, cool place, they will be out of all danger whatſoever. I have known tares thus kept that were good for all purpoſes

fourteen

fourteen years after the threſhing; and they probably would have kept as much longer.

The thetch, fetch, or vetch.

Few occupations among the common part of mankind, give origin to ſo many ſtrange terms as the huſbandman's. We have been careful to explain them in the courſe of this work; and, we hope, by that means have rendered not only our own, but the writings of others more uſeful: the ſubject of the preſent chapter is an inſtance. We ſee in moſt books of huſbandry written of late time, the name of the thetch, a plant recommended extreamly for the improvement of land. This is a kind of pulſe very well known by its appearance, and by the ſhape of the ſeed, in the countries where it is cuſtomarily raiſed: but how is the farmer in a remote part of the kingdom, who wiſhes to bring home the improvements practiſed in other places, to know what is meant by the name? No dictionary will explain it to him, for there is no ſuch word in the Engliſh language. If he look into the Engliſh herbals, he will not find it in any of their indexes; nay, though ſome of them have a particular table of barbarous words, as they are called, thetch is not among them. The reaſon is, that it is a barbariſm of later origin than their time.

In ſome of the books wherein thetches are named, he finds them alſo called fetches, but this is a word as arbitrary and unmeaning as the former, there being no ſuch properly in the language. In ſome it is, as they apprehend, farther explained by being written vetches: but this is a term that has worſe conſequences, for it creates confuſion. There is ſuch a word as vetch in the language, but it is the Engliſh of the word Vicia in Latin, and therefore ſignifies the tare.

In the two other caſes, theſe writers uſe words that cannot be underſtoood, becauſe they have no received meaning at all; and, in the latter, they uſe one that means ſomething elſe.

If the farmer in a remote part of the kingdom, ſhould from reading any of theſe popular works, be induced to propagate the thetch, he could never find any meaning of that word except the tare; and he would therefore, after a great deal of difficulty, find what they did not mean. Themſelves know what they intended by it, becauſe a word will ſignify any thing that cuſtom appoints; but one purpoſe of this work being to convey to the farmer of one county, the knowledge of another; we muſt make them underſtand each other's language.

There is a plant of the pulſe kind very frequent in the warmer parts of Europe, the flower of which reſembles that of the field pea, but its pod is ſhort, and ſeems blown up. They call it in Latin Cicer, and its proper name in Engliſh is the Chich. Some have called it the Chich pea, others the Chich vetch; and in ſpeaking of the ſeed, the common expreſſion is chiches. When the Chich firſt was brought into uſe among the Engliſh farmers, the name puzzled them; and as they were accuſtomed to hear it ſpoken in the plural number chiches, they by one miſpronunciation after another, called it cheches, thetches, fetches, and vetches.

This then is the pulſe the writers on huſbandry mean by the thetch, and under theſe names of Chich and Cicer, it will be found in the writings of thoſe who have treated of plants.

The chich, or thetch, is of the pulſe kind, but ſingular in the ſhape of its pods. We ſhall firſt make the reader properly acquainted with its nature, and its ſeveral kinds, and afterwards with the moſt advantageous manner of cultivating it.

Of the nature of the Chich, and its kinds.

The Chich is a weak and ſtraggling plant. The root does not penetrate deep, nor ſpread far, ſo that the ground is not impoveriſhed by it as by other growths. The ſtalks are numerous and weak, they will grow in the larger kinds, three foot long; in the leſſer two foot; but always lie upon the ground. This is far from a diſadvantage to the farmer, for by thus lying upon the ſurface, they cover it the more perfectly; and make it light and hollow.

The leaves reſemble thoſe of the pea and tare, but they are more beautiful. Each is compoſed of three or four pair of leſſer, and an odd one at the end, and theſe are all of a pleaſant green, and notched round the edges. The flowers grow from the bottoms of the leaves, and are of the ſhape of thoſe of the pea or tare, but ſmall. They vary in colour according to the kinds, being white, red, or duſky, and the ſeed is of the ſame colour, which follows them. The pods that come after the flowers are of the ſame general ſtructure with theſe of the pea kind, but they are ſhort, thick, and blown up as it were, and each contains only one or two ſeeds. Theſe are not altogether round, but of a pointed ſhape in one part; from whence fanciful people have ſuppoſed they reſembled the head of a ram, and the plant has been called the ram Chich.

The Chich is a native of Italy, and ſeveral varieties of it are cultivated in the gardens of that kingdom; as alſo of Spain, and Portugal, and in the ſouth of France. They raiſe them as we do peaſe, and for their tables; whence their gardeners, as ingenious as ours, have made innumerable varieties. We are writing for the farmer, and he is to raiſe them for a very different purpoſe: all the diſtinction he need regard is, that of the two kinds which from their ſize are called the larger and the ſmaller Chich, and from the ſeaſons of ſowing them, the winter and the ſummer Chich, or thetch, the larger one is the winter Chich, for being more hardy it ſtands the cold; and the ſmaller one being tender, muſt be ſown in ſpring.

The kinds cultivated in gardens abroad are principally three, the white, the black, and the red Chich; they are called by theſe names according to the colour of their flower and ſeeds, and are not there preferred to peaſe, but found better ſuited to the countries. Our pea is vaſtly preferable, according to the accounts of the Italians themſelves, both in its taſte and bearing, but it will not thrive ſo well with them as here; and theſe being natural to the climate, are cultivated in a great meaſure in its ſtead. The Engliſh farmer is to count little upon the fruit of this pulſe more than for ſeed: therefore he is to ſee it in a proper light altogether different from theirs. With him it anſwers two purpoſes, the feeding his cattle in the ſtalk, not ſeed; and the enriching of the ground.

This enriching of the ſoil depends partly upon the keeping it clear of weeds, partly upon the little nouriſhment the plant requires, and partly upon the covering and ſhelter it gives the ſurface.

This laſt is the greateſt conſideration; for, when a piece of ground is lightly, but thoroughly covered, and little exhauſted, it grows mellow, and becomes with little farther expence, fit for the richeſt crops. For this reaſon the large Chich is to be prefer'd to the other, as better covering the ground: but this is not all its advantage, for being ſown in autumn, it provides an early food for cattle when they moſt want it.

Notwithſtanding this, the farmer will find many particular circumſtances wherein the ſmall or ſummer Chich is preferable, with reſpect to the time of ſowing, the nature of the provender, and the condition of the ground.

Of the proper ſoil for Chiches; and its preparation.

The huſbandman is to conſider theſe little pulſes in a very different reſpect from the valuable grains: the preparing the ſoil for them, lies in a very little compaſs, for they are rather ſown to prepare the land for ſomething elſe: but in the choice of the ground, there is a great deal to be conſidered.

He has a variety of theſe, the tare, the chich, and the lentil: they will all anſwer the ſame purpoſe to him, and they will thrive variouſly on different ſoils; therefore he is to underſtand what kind ſuits each ſoil, that he may have the double advantage of enriching his ground, and increaſing his crop. It is particular in theſe ſpecies, that the larger they grow, and the more they yield as fodder, the more and better they improve the ground for a ſucceeding crop.

As the tare loves a dry ſoil, the Chich will bear one that is ſomewhat damp. It is a proverbial ſaying among huſbandmen, no rain will kill a thetch, and the ſame quality of bearing heavy ſhowers while young, for that is the ſeaſon of them, will render it capable of living in a ſoil naturally chilled by wet: but this muſt not be carried too far. Chiches will not live on a bog. In all things there muſt be moderation.

The beſt ſoil is a ſoft mellow earth: it will thrive excellently upon a rich field of this kind after barley or other corn.

Such a ſoil might be excellent for tares, but there may be accidents wherein it would fail for that crop, and yet notwithſtanding which, it would be fit for the Chich. If a mellow ſoil be upon a hard gravel, that will excellently ſerve for tares, becauſe the wet which falls will get through the lower bed, after it has done its office to the roots of the plants; if a mellow earth have a bed of clay under it, tares will not grow upon it, becauſe the clay holds the water too much, will chill their roots, and make the plants poor and yellow. Such a piece of ground as this will do excellently for chiches; indeed, better than any other: this is a difference the farmer ſhould remark carefully; one of theſe ſoils will do for one, the other for the other crop; and he who if he had ſowed without conſideration, might have had very indifferent crops of both, will, by thus examining the ſoil, and ſuiting the pulſe to it, have very good ones from both.

After a rich mellow earth, the beſt ground for the Chich is a ſtiff loam.

Loams may be conſidered as ſoils of quite different qualities, according to the various compoſitions of the mixture. All of them have ſome ſand and ſome clay: but when the ſand is in the greateſt quantity, they are looſe and warm ſoils; where the clay, they are ſtiff and binding. In the former caſe their dryneſs and warmth make them very fit for the tare; and, in the latter, their ſtiffneſs and binding quality retaining moiſture, make them ſuit the Chich.

Proper ſoils being choſen, there is little trouble in preparing them, but ſome difference in the manner of working when the ſeed is to be let in, according to the nature of the ground.

All that is required for theſe crops when they follow corn, is to plow in the ſtubble: this ſoon rots, and is all the manure that need be allowed them, the ground will be in ſufficient heart to produce them.

Of ſowing chiches.

Theſe leſſer pulſes are very well produced in a year of fallow; and when eaten upon the ground, they give the land, by means of the dung and urine of the cattle, a very good dreſſing.

The winter Chech, is to be ſown the firſt week in October, and will get a good root, and a ſtrong head, and be able to ſtand againſt the froſts: when ſpring comes, it will puſh ſo vigorouſly, as very ſoon to be in a condition for eating on the ground; or mowing for that purpoſe.

The ſummer thetch, ſhould be ſown in the middle of February. The rains that naturally follow, puſh it up in the ſhoot, ſo that in a favourable time it will be ready for cutting in the end of May, or very well in the beginning of June, and may be eaten upon the ground ſooner. The winter thetch, if ſown early in October, will be ſo well grown by Lady Day, that ſheep and lambs may be fed upon it.

The next thing to be conſidered, is the choice of ſeed; and after what we have ſaid of tares, a few words will give the neceſſary information in all pulſe: the danger is, that there are vermin, and that there have been damps; this may be diſcovered by the dead look, or the duſty appearance of the ſeed; and, in either caſe, that is to be rejected. Let the farmer chuſe ſuch as is bright, weighty and free from duſt, and he will not be diſappointed.

The quantity would come next, but in this, as the manner of ſowing, ſuited to different ſoils, make ſome variation, that muſt be explained firſt.

If the ſoil be clayey, or of a ſtiff loam, the manner of ſowing muſt be this. The ground muſt be broke with the common wheel plow, and the ſeed ſcattered in by hand in that manner the farmers call ſpraining of it, in ridges. It is thus to be plow'd in; and after this, the land is to be harrowed even, only leaving water furrows between the ridges.

In this manner accidents are prevented: none of the ſeeds are left expoſed to the dews of the night, which would have very bad conſequences.

When the ſoil is a mellow earth, with a proper bottom, I ſhall adviſe the farmer to ſow his chiches in broad lands, with a ſingle plowing, harrowing them well in.

The uſe of the crop is alſo to be conſidered before the ſowing, that a proper method may be taken to prepare in time for it. Some are of opinion, that eating upon the ground is beſt; and others prefer the mowing and carrying off. This, when the land is of a middling nature, may make a difference in the manner of ſowing; and when any one of theſe two methods are rendered neceſſary by the quality of the ground, the huſbandman muſt conform to that neceſſity, rather than to the common opinions. When chiches are ſown on ridges, they ſhould be eaten upon the ground, becauſe mowing is difficult; but when they are ſowed in broad lands 'tis beſt to mow them.

Cattle tread down and deſtroy more than they eat, and the produce of one acre, carried to the rack, will go as far as that of two eaten upon the ſpot.

Sheep and lambs do leſs damage than ſuch cattle as have broader feet; and their dung and urine, and the moiſture from their bodies where they lie, gives a richneſs to the ground that may make amends: but this is not the caſe with horſes. In wet ſeaſons they cannot be turned in; at beſt they deſtroy a great deal by their heavy feet, and they can come upon the ground but once; whereas the ſame crop may very well be eaten twice by ſheep and lambs in ſpring.

The proportion of the ſeed varies, when ſown on ridges, after wheat or barley, two buſhels and a half of the large will be a proper allowance to the acre; and of the ſmall three buſhels. When it is ſown in broad lands three buſhels of the large, and two and a half of the ſmall, is the proper allowance.

In other crops we depend upon their produce in the grain, therefore a few plants well nouriſhed is what we ſhould aim at; but here the farmer does not form his expectations of any ſuch crop. Two points are to be obtained by the chiche, covering and mellowing the ground; and ſupplying cattle with food. Both theſe will be beſt anſwered by the chiche growing cloſe.

Of the management of chiches, and their ſtanding for ſeed.

Whether it be in autumn or ſpring the chiche is ſown, it requires no farther care from the owner, after it is harrowed into the ground: it will riſe quickly, and ſhoot ſtrongly; and being ſown thick will deſtroy all the weeds that ſhall attempt to riſe among it. In either caſe he is to leave the whole to nature and wait her progreſs, obſerving the growth from time to time, to find when it becomes fit for being eaten: in this he is to conſider alſo the condition of his ſtock, and their other provender; for he may find it profitable to turn in his ſheep and lambs a week or two before he could wiſh, for the ſake of the chiches, when they would elſe decline for want of proper food.

The winter chiche comes in earlier than the ſpring kind, but the latter is the wholeſomeſt food for lambs.

This does not cover the ground ſo well as the larger, nor yield ſo good a crop of ſtalks and leaves; but there are advantages. It is beſt for the ſmaller cattle, and it grows up much ſooner after cropping than the other.

The winter thetch ſucceed beſt on broad land, and the ſmall on ridges. I name this the more punctually, becauſe in this county (Middleſex) the cuſtom is the contrary method in moſt caſes. The large thetch is beſt for mowing, and the ſmaller for eating on the ſpot; and this is a farther reaſon why the ſmall ſhould be ſowed preferably on ridges.

We have obſerved what neceſſary difference the nature of ſoils may make; we ſpeak here of what is beſt when the choice on that account is indifferent.

As to the uſe of chiches the ſtanding for ſeed is the leaſt, yet it is needful ſome ſeeds ſhould be ſaved, and therefore ſome care muſt be taken about it. The farmer ſhould prepare for this in time, by properly looking forward.

If he have ſown two fields with chiche, that which is dryeſt is the moſt proper for ſeed; if only one, he ſhould ſee which is the warmeſt part of it. In either caſe he muſt ſet aſide ſuch a piece as is convenient for ſeed, keeping cattle off by fencing, or if horſes by ſtaking them down.

He will find his account in conſidering this at the time of ſowing.

Let him, when he orders his field to be plowed up for this purpoſe, ſhew the ſeedſman the ſpot he fixes upon for letting a crop ſtand for ſeed, and order him to ſtrew the chiches there more ſparingly. Half the uſual quantity will be ſufficient for this ſpot, and he will get more ſeed, and better than if he allowed the whole. He will ſoon ſee the difference in the growth of the plants; and it will be proper to have this ſmall part where they are ſet for ſeed once weeded.

Theſe are to ſtand undiſturbed till the chiches are thoroughly ripe in the pods; and then are to be reaped together and threſhed, after a gentle drying.

The ſeed is be ſpread upon a floor and dried. It will be adviſeable for the owner to exchange this with ſome diſtant farmer, rather than ſow it again himſelf; but he will ſee by the look and condition of his own, when thus cur'd, how the other ought to look when good.

Of the manner of feeding with chiches.

Part being ſet aſide for ſeed, the farmer is to conſider the reſt as food of his ſtock, and to contrive for ſpending it among them. There are three ways of uſing it: firſt, by turning in of cattle: ſecondly, by cutting it green for them: and thirdly, by making it into hay.

Cattle are fondeſt of it when they eat it upon the ground: it is the moſt profitable when mowed green, and given them in racks; but it is the moſt wholeſome when dried. In this ſtate cattle reliſh it very well, and according to its condition will prefer it to other foods. The larger it is, the coarſer hay it makes, the ſmaller the finer and more tender.

The little chiche makes the beſt hay; but the large kind, when not too rank, anſwers very well.

The huſbandman ſhould cut at proper times and in proper quantities, and conſider that the value depends on the age and kind; he will therefore allow the proper portions for feeding, and will take his opportunities of cutting and drying ſome of the beſt and choiceſt, when it is of ſuch a growth as will render it moſt agreeable.

His conſideration may extend beyond the common conſideration of the growth. He may recollect at what time it will be uſeful to give his lambs a feeding of the fine young ſhoot of the thetch, and cut ſome of the beſt parts of the ground accordingly. The plants will grow up a great deal quicker when they have been mowed, than when they have been gnawed in eating; and he will have here a ſecond ſpring, wherein there will be tender, delicate, and wholeſome food for the lambs, at a time when he could not have got it in the ſame condition any where elſe.

When chiches have been thus managed, during ſummer, the owner will find he has made a very good uſe of his field, but the greateſt advantage is behind, for his land which was before in ſuch an exhauſted condition, as to require the refreſhment of a fallow, has all the time it was nouriſhing this uſeful crop been getting into heart.

He has his choice of wheat or turnips in the firſt place, and if he diſapprove theſe, of almoſt any other kind.

When a good piece of ground has been covered with a crop of chiches, it will, by Michaelmas, be ſo mellow and fine, that he may ſow wheat upon it with great ſucceſs.

If he chuſe turnips, they may be ſown with one plowing, and there will be no reaſon to fear an early and a profitable crop.

We have mentioned the principal corns and growths among which the huſbandman may take his choice; and we ſhall hereafter treat of coleſeed. Few things are more profitable, under good management; and it never comes better than after a good crop of chiches.

The winter chiche is moſt profitable, becauſe of its coming early, when there is a ſcarcity of other food; and it covers land the beſt: but it is proper we add what there is againſt it.

The diſadvantage of the winter chiche, is the uncertainty of the crop; for it ſometimes periſhes by froſt. It often fails even in February, or the firſt week in March, by the ſeverity of froſts that come after hot days.

The ſpring ſowing is always ſafe; and as the ſevere weather in February will often check thoſe crops, which it does not deſtroy, theſe coming up quick, and meeting no ſtop, overtake them.

There is no better food for the horſe than freſh mown chiches, he will eat them freely: they take at firſt the common effect of green food in a kindly manner; after which nothing puts him better in fleſh.

It is of the ſame advantage in fattening of horned cattle; and is in a particular manner ſuited to cows, becauſe at the ſame time that it fattens them up, it makes them yield a large quantity of milk, and does not give it that ill flavour which it gets from the feeding on ſome of the artificial graſſes.

Ewes, while they feed on it, have the ſame advantage, fattening themſelves while they ſupply their lambs.

Of lentils.

Lentil is another of the ſmall pulſe, which has not been ſufficiently known in the early practice of huſbandry: we ſhall endeavour to render it more univerſal.

Farmers, in thoſe countries where this pulſe is propagated, call it the till or tills.

The lentil agrees with the chiche, becauſe it has a ſhort pod: but not ſo blown up as that, nor have the ſeeds that remarkable figure, by which thoſe of the chiche reſemble the head of a ram.

The lentil is the ſmalleſt of the pulſe kind. Its root is little, and its ſtalks numerous and ſpreading, ſo that it covers the ground well, and draws little nouriſhment, improving the land; but in a manner inferior to the chiche, becauſe it is ſmaller.

The ſtalks of the lentil are a foot and a half long but weak, the leaves are compoſed of ſeveral pairs of ſmall ones, and are of a pale green; they differ from thoſe of the chiche in that they have no odd one at the end; for there is a tendril in that part.

The flowers are little and rediſh, ſometimes of a deep purple, and ſometimes white: the pods are ſmall, and there are uſually two ſeeds in each.

The lentil may be eaten upon the ground or in the rack, and is good green or dry. Lentils are a good food for horſes, fattening them and keeping them in health. Sometimes when eaten greedily green they throw them into diſorders, but this may be prevented by giving them in a proper manner. The beſt way of horſes eating them is dry. They are alſo good for cows, ſheep, and hogs; for the former in the leaf, and for the other when in fruit. They require no care after they are in the ground, and very little charge in getting them into it.

Of the proper ſoil for lentils, and the manner of ſowing them.

There is an advantage to the huſbandman, in crops that grow upon poor land; the lentil is one. The chiche will thrive upon ground that has been exhauſted by corn; but the lentil will ſucceed on ſuch as is naturally poor, and has been alſo exhauſted.

The lentil thrives upon ſandy, gravelly, or chalky ſoils; it is not under that neceſſity of wet the chiche is, but will come to good where there is but the leaſt fund of nouriſhment. In the pooreſt, hungrieſt loams the lentil yields a large crop: and never fails to leave that or any other land in a much better condition than before.

Land requires little preparation for lentils: they are to be ſown in ſpring. The middle of March is a proper time; and the end of that month, or the beginning of April, will do very well.

This pulſe is ſo ſmall it does not well cover the ground, for which reaſon it does not enrich it like the other kinds: it may be ſown with oats or barley. Oats and lentils will be ripe about the ſame time, and may be reaped, and threſhed together, after which they will eaſily be ſeparated by throwing: the oats being lighteſt will fly fartheſt, and the lentils from their weight, and their ſmooth round form, which the air lays leſs hold of, will drop by the way.

When they are ſown with barley they may be ſeparated in the ſame manner; and if care be taken in the throwing, there will be little farther trouble.

Seed lentils ſhould be plump, ſmooth, and ſhining: and the farmer will do well to exchange ſeed with ſome other, who occupies a different land. According to the ſervice, a different manner of ſowing will be proper. It is uſeful to be eaten in the ſtalk, but it is alſo worth regard as to the ſeed. It is preferable to the chiche, becauſe the pods are more numerous, and the ſeeds are not only produced in greater quantity, but are more valuable.

The covering of the ground being leſs a conſideration, gives a new method of culture for this ſpecies, that is, by the drill and horſehoeing method. The lentil will thrive on the pooreſt ground; but we ſhall adviſe the farmer, on ſome occaſions, to prefer better.

Let him conſider what is the principal uſe for it. If he deſign it for eating, let him ſow it in the common way, as we have directed with reſpect to chiches; but if he have his eye principally on the ſeed, let him ſow it by the drill, in ſuch manner that it may be horſehoed.

This infers a great difference in the quantity of ſeed.

When lentils are ſown for feeding, the proper quantity is a buſhel and a half to an acre: if intended for ſeed, and ſown by the drill, three pecks is a ſufficient quantity.

The beſt time for ſowing them is the third week in March, and they ſhould be ſown in double rows, with about eight inches between, and with ſuch intervals, that the horſehoe may conveniently come in.

The produce will be very great; and this is the beſt way of ſowing them on poor land.

Of the management and uſe of lentils.

The lentil, as ſown in the common and drill way, requires to be ſpoken of diſtinctly. If it be ſown by hand, nothing more need be done, for it will riſe thick and deſtroy weeds. When it is ſown by drill, the horſehoe muſt go once through the middle of each interval, when the firſt ſhoot is up; and then no more trouble is neceſſary. They are to ſtand till ripe, and then to be reaped and dried, by lying in little heaps in the field, and then threſhed.

If they be ſown in the common way, with oats or barley, when ripe they muſt be threſhed together; when they are ſowed alone, in the common way, there requires care and conduct in the management of them.

Some are to be left to ſtand for ſeed, but the greater part is to be eaten.

Lentils will not grow up after eating, ſo free as the chiche, but they afford a good ſupply at the cutting. For all purpoſes the cutting and drying is the beſt method. The ox, cow, and horſe are fond of the lentil dried, and it nouriſhes them greatly.

The beſt time for cutting it for oxen and cows, is when the pods begin to fill; but for horſes it is beſt when the lentils are nearly ripe. It muſt not be let to ſtand till they are quite ripe, but juſt when the ſeed is large, and the leaves are not decayed.

When lentils and barley have grown together, they may be ground together, and will make a very wholeſome kind of bread; being boiled in the manner of peaſe, they are eatable: they are excellent in the ſtraw, to make cows give abundance of milk, and they give it no ill taſte; and there is no plant whatſoever that better aſſiſts the ewe for the ſuckling of her lambs.

Of buck-wheat.

Buck-wheat, called in ſome places brank, is very different in kind from the ſeveral plants before-named, but it is cultivated as an herb that may yield ſome profit, and at the ſame time improves the ground whereon it grows.

Buck-wheat is upright and grows a yard high, and has a ſtiff, firm, and round ſtalk, which divides toward the top into ſeveral branches. The leaves are broad, they are forked at the end next the ſtalk, and pointed at the other, and they are of a pale green, often yellowiſh. The flowers ſtand on the tops of the branches in large tufts; they are ſmall and white, and the ſeed follows, which is of a triangular ſhape, large and brown on the outſide, but with a white kernel within. Each flower of the buck-wheat conſiſts of one white little leaf, divided into five parts, and has no cup. Within this are eight little rediſh lumps, which contain a ſweet juice; theſe form what is called the nectarium of the flower. In the center there grow eight ſlender threads, of the length of the flower, with little buttons at their ends; among theſe ſtands the rudiment of the ſeed: this is of three ſquare form, and has three thready ſubſtances growing to it, which are tufted at the ends: theſe ſerve to catch the duſt from the little buttons, on the tops of the other threads for the ripening of the ſeed. One ſeed follows every flower, and the flower itſelf ſerves it as a covering, growing dry without falling, and clinging round it.

It is a native of the eaſt, and is uſed in ſome parts for bread.

There are two uſes in this crop, its ſeed is of ſome value, and it will ſerve as a manure; or as the farmers expreſs it, a lay, whereon to ſow wheat or rye; in this caſe nothing is ſo advantageous, as the plowing it in entire at a proper growth.

Of the ſoil for buck-wheat, and the manner of ſowing it.

Buck-wheat will grow on the moſt barren lands, heathy land, or naked gravel, or in the ſtone countries, one of thoſe lands where chips and fragments of ſtone make up, in a manner, the ſurface, buckwheat will grow on any of them. It requires little preparation, and needs not be ſown till very late.

Chuſe the faireſt and ſoundeſt ſeed. Such as is dry and of a bright colour is beſt.

The quantity is to be different, according to the deſign of ſowing. When buck-wheat is raiſed for ſeed, a ſmall number of plants well nouriſhed is what the farmer is to deſire; but when it is ſown to be plowed in as a manure, the larger a quantity there is upon the ground the better.

When buck-wheat is raiſed for ſeed a buſhel is ſufficient for an acre; but when it is meant by way of preparation for another crop, four buſhels to the acre is not too much. The beginning of May is the earlieſt it ſhould be put into the ground: the middle of that month is a better time, and it will do to the very latter end. Buck-wheat being a native of warm climates, does not bear cold; and it is ſo quick a grower that it needs not be ſown early.

The common method of plowing and harrowing, and that in the lighteſt manner, covers it, and it will ſhoot at its own time, let the weather be what it will: rain or dry makes little difference.

When once up it grows apace. The ſort of ground allowed to it does not favour the growth of weeds, nor do they grow quick upon it; ſo that the buck-wheat thriving apace, quickly gets the better of them.

Of the management and uſe of buck-wheat.

Beſide the two uſes of ſeed, and plowing into the ground, it has another, which is, being eaten by cattle. It comes in at a time when other provender is ſcarce, the graſs being burnt up by the heat; and the horned cattle toward the end of ſummer, generally in great want of good freſh food. Buck wheat being then juſt coming into bloſſom, the cows are very fond of it; and it is an excellent nouriſhment, rich and wholeſome, making them yield a great quantity of milk, and not giving it any diſagreeable taſte. There is no better butter or cheeſe, than ſuch as is made of their milk when they have fed in this manner.

If the farmer intends his crop for this uſe, he muſt ſow it thick, but not ſo thick as when he intends it for plowing in; two buſhels and a half of ſeed to an acre will yield a very good growth for this purpoſe.

After the cows have eaten it down, the ſtubble may be plowed in, and the land will do very well for a crop of rye.

When it is to be ſowed in entire, the crop is to ſtand till full grown and in flower, but not till the ſeed is formed. Juſt before that it is in the richeſt condition for manure, and that opportunity is to be taken.

When the ſeed is the point in view, and the field has been ſown ſparingly for that purpoſe, the plant will be much ſtronger, and they will ripen a great deal.

The farmer is to watch when moſt is ripe and none fallen, and then he is to get in his harveſt.

Buck-wheat may ſtand longer than almoſt any crop, for none holds the ſeed ſo firmly. But there is to be ſome regard to the ripeneſs; and when but little is left that can come to good, the whole is to be cut.

The way of gathering it is by mowing; and when down it is to lie ſome days in the air before it is houſed; there is no great danger of accidents, for ſcarce any thing is ſo hardy. When the ſtalks are grown limber, and the grain firm, it is to be carried in and threſhed. The produce is very great. Fifty buſhels for an acre may be had from very moderate land, and much more is common from ſuch as is any thing rich.

The uſes of the ſeed are many, it ſerves excellently for hogs, who are fond of it and fatten very well upon it: many kinds of poultry alſo like it; and in ſome countries it is eaten by the poorer people, made into a kind of pancake, with ſome wheat flower among it. It is a thriving food for horſes. But it ſhould be broke in a mill before they have it, otherwiſe the ſkin is ſo tough it paſſes through them without doing any good. Cattle will alſo eat the ſtraw, but it is not nearly ſo nouriſhing as the grain.

End of the SECOND VOLUME.